ELECTRICAL SOUTH

Serving the 18 Southern and Southwestern States

An outstanding contractor analyzes estimators and estimating — pg. 24

DECEMBER, 1955

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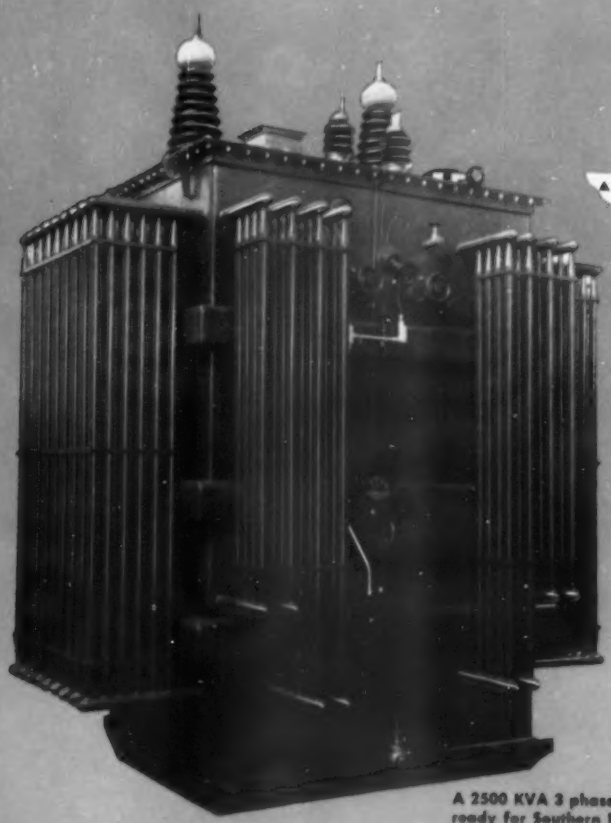
made in the South . . . to serve the South



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Another Installation

A Wakefield Ceiling Greets Visitors to New Electronics Plant

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Volume 35 **Number 12**

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ELECTRICAL SOUTH

SERVING THE 18 SOUTHERN AND SOUTHWESTERN STATES

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TO HELP THE BUSY READER—

A recent survey made by the Electric House Heating Section of NEMA has revealed that more than half of the nation's **utilities favor home electric space heating.** Their reasons for this attitude and other details of the survey are given in the article which begins on **page 20.**

The female partner in a contracting firm tells **how she found her place in the electrical business** on **page 22.**

One of the outstanding electrical estimators of the South, James Dandelake, presents a lucid discussion on **estimators and estimating.** The article beginning on **page 24** of this issue is adapted from his recent speech before the annual convention of the Carolinas NECA Chapters.

Contractors and other employers are being confronted constantly with problems in labor relations, and a new ELECTRICAL SOUTH feature — **Case histories in labor relations** — is designed to give exemplary cases of grievances and how they were decided by arbitration. The first set of these examples is found on **page 38.**

The article on **page 55** describes **substation maintenance and test practices** used by Duke Power Co., giving in detail the procedures carried out in the plan that has proved most valuable for them.

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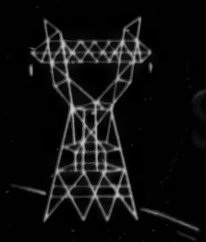

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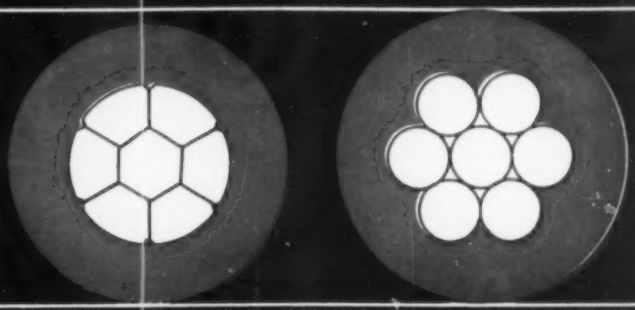

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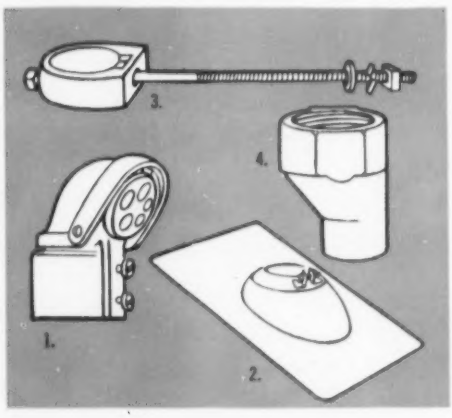

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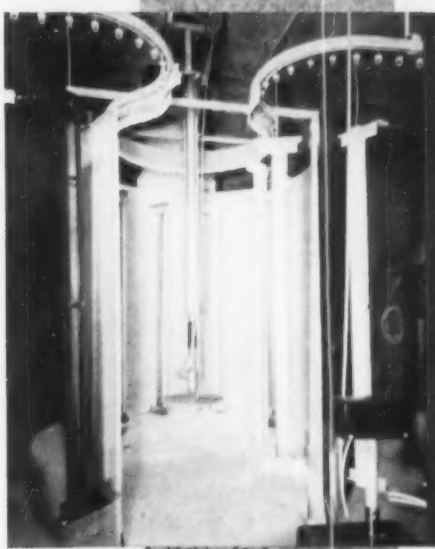

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YOU SEE diagrams and pictures that explain transformer design characteristics which meet these various operating conditions.

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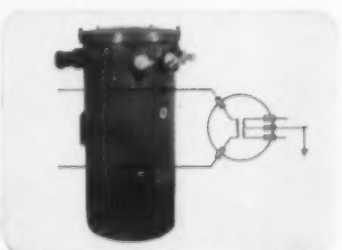

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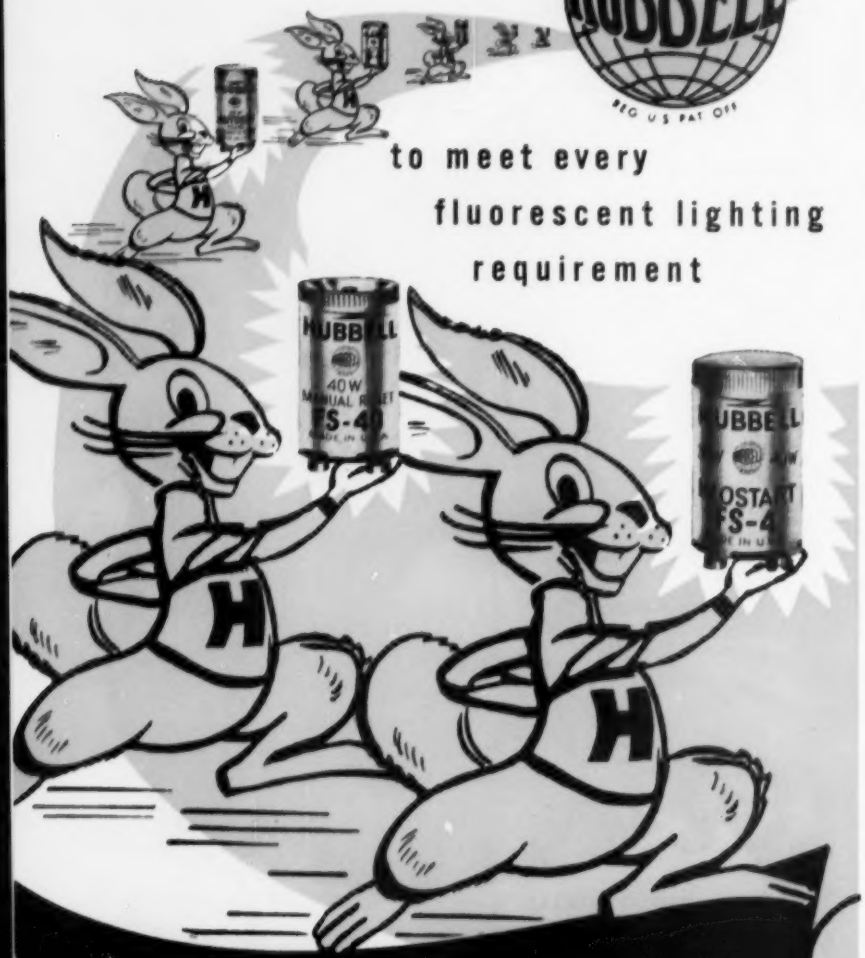

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The Magazine

for

Southern

Electrical Men

Is

ELECTRICAL SOUTH

◆

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of our
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In the accompanying pages are the descriptions of scores of useful catalogs, application information booklets, and technical publications. These are available without charge.

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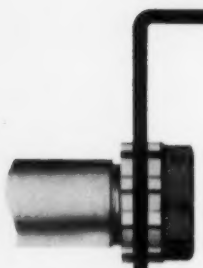

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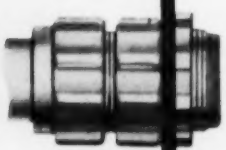

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Economic comment

by J. Whitney Bunting, Ph.D.

Buyers quality conscious

The most important report that arises from current retail store operations is the trend toward quality consciousness on the part of the nation's consumers. Retailers who fail to recognize this inherent trend are in for some very rough days particularly in the holiday season. There is now a far less demand for "cheap" items than at any recent merchandising period. The public, regardless of past preferences in reference to either price or quality, now seems to want higher priced merchandise and, at the same time, better results from the use of the product than they previously received. This is not a "sectional" change but one that covers the national market.

Perhaps a large factor in this change of "buying opinion" is due to the higher incomes generally that American people enjoy. Certainly all statistics tend to bear out the fact that wages and salaries have increased. Yet this is not the entire story. People are tending to upgrade themselves as far as their personal purchases are concerned. Higher priced automobiles are moving more freely than ever before. High priced jewelry, television sets, and all manner of major household appliances are being acquired by families that, only a few short months ago, would have refrained from making such a major financial outlay.

Dr. Bunting is a well-known economist and educator having special knowledge of the South.

Confidence frees savings

There is no doubt that public confidence in business progress is at a high level. This feeling not only persists among the industrial titans but also, with the exception of some small economic groups, among the rank and file of citizens. This confidence seemingly frees much purchasing power that otherwise might be hoarded and kept out of the consumer markets. The economic importance of public confidence in business conditions and operations should not be underestimated. Historically, business recessions or upheavals have frequently been related to the degree of confidence held by the consuming and producing publics in the stability of the economic machine.

Regardless of the cause of this free flow of purchasing power into the quality market, it is essential that merchants take note of this change and stock their shelves accordingly. Failure to do so may result in lost business and weakness in market competition. People, in their search for quality, are prone to "shop around." Through this shopping mechanism they will naturally "tag" various stores with the quality label (or the inferior label) as the case may be. Since it is extremely difficult to remove such stigma, once associated with a particular retail outlet, it is essential that proper care should be exercised to raise the banner desired at this time.

One word of caution should be noted here. The idea of quality should not be confused with plain high prices. It has been indicated that buyers are perfectly willing to pay more for today's products but only if they are getting more from the use of the merchandise. This value in use concept may apply to greater quantity, to better service, to added prestige, or to any of a dozen other greater benefits. But the value premium must be recognizable if a greater financial outlay is required. Merchants should not be misled by "easy money" thinking. The buyer today is more critically aware of quality and value than at any other previous time.

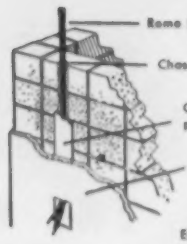
Stock market trends

All factors analyzed recently continue to point toward continued strength in the stock market, at least through 1956. The earlier pronouncements by experts that next year might see a general softening of stock prices now appear to be premature. It can be expected, of course, that some readjustment may appear in the future. That is, that prices may drop to lower levels more commensurate with the apparent value of the shares marketed. However, the rate of business expansions for 1956, the free flow of money into the market, and the fact that most securities today are not overpriced, should maintain the level of security prices through 1956. In fact there could

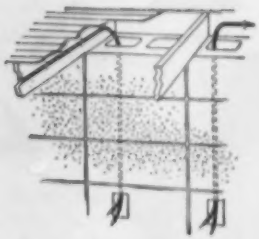
(*Continued on page 88*)

—National Research Bureau, Inc.

Buried directly in earth, Rome FlexAll is ideal for wiring between buildings.



Embedded in plaster, Rome FlexAll makes for neater appearance in rewiring old buildings.



Rome FlexAll is easy to work within hollow spaces of masonry block or tile walls.

Installed in livestock buildings or other locations destructive to conventional non-metallic sheathed cable, Rome FlexAll is safe, nonrotting and flame resistant.

Build sales volume profitably

with this U/L approved multi-purpose cable

Distributor and contractor alike profit by recommending Rome FlexAll®, thermoplastic non-metallic sheathed cable. Versatility and low cost make it *today's* wiring material for industrial, commercial, farm and residential branch circuits.

Because it is neat, easy to work, safe in damp or corrosive locations, FlexAll helps you build sales volume. It is suitable for both underground circuits direct in earth, and interior wiring in wet or corrosive locations.

The National Electrical Code recognizes FlexAll for multi-purpose use:

Single Conductor—U/L Approved as Type UF

- For branch or feeder circuits buried directly in earth with overcurrent protection.

Multiple Conductor—U/L Approved as Type UF and NMC

- For branch or feeder circuits direct in earth, with overcurrent protection.
- For interior wiring, *exposed or concealed*, in dry, wet or corrosive locations.
- For installation in hollow spaces of *outside or inside* masonry block or tile walls.
- For embedding in plaster or shallow chase in masonry, when suitably protected.

Part of today's modernization trend, Rome FlexAll was developed for safer wiring of farm buildings. It leads to the vast potential of that market. Dual approval for direct-in-earth burial makes it ideal for a host of outdoor lighting applications.

Industrially, there is a growing demand for FlexAll to wire food processing plants, dairies, breweries, packing houses, cold storage and ice plants. It has long life even in salty, smoky or humid air.

Much of the sales and profit potential of Rome FlexAll comes from its versatility:

- It permits smaller inventory—one type of wire for many applications.
- Its workability saves on-the-job time.
- Neat and pleasant to handle, it makes satisfied customers.
- It has long life.
- It is safe, a valuable factor in fire prevention, especially in rural areas.
- It is nationally advertised and approved as a multi-purpose wiring material.

A thermoplastic compound, Rome Synthinol®, is used as insulation and sheath on Rome FlexAll. Individual conductors are wrapped with glass fibers on two- and three-conductor types . . . making the entire construction inorganic with nothing to rot or deteriorate. FlexAll resists flame, moisture and abrasion.

Single-conductor FlexAll comes in sizes 4 AWG through 14 AWG. Standard color is black. Two- and three-conductor types come in sizes 10 AWG to 14 AWG. Standard color is pearl gray. Two-conductor sizes are available with or without ground wire.

Get your share of the profitable sales volume that is being built with Rome FlexAll. Bulletin UF-1 gives more details. Write for it.

See us at the 7th National Plant Maintenance and Engineering Show, Convention Hall, Philadelphia—January 23 to 26, 1956

It Costs Less to Buy the Best

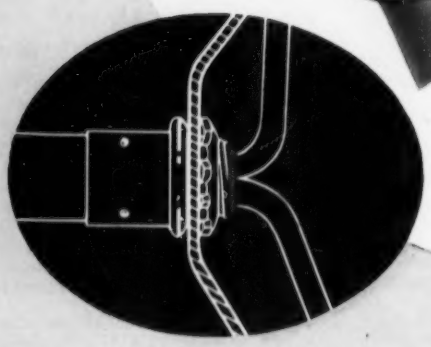
ROME CABLE Corporation
ROME · NEW YORK
and
TORRANCE · CALIFORNIA

Red Throat

B-M 21B, THE NEW INSULATED THROAT INDENTER CONNECTOR FOR E.M.T.

Four Ways Finer

1. Protruding rounded red plastic lip of bushing prevents cutting of insulation — eliminates shorts.
2. Full thread screws into all conduit fittings. Lip of RED THROAT bushing protects thread from damage.
3. Deep dished eight pronged lock nut is easier to drive on — screws flush to shoulder and digs into metal of box for vibration proof positive ground.
4. Permanent locked-in bushing insures smooth burr-free raceway for easy fishing. No extra work and costs no more.



Briegel, the Original Indenter Fittings are neater in appearance, easier and faster to use. Installation is simple and less expensive. Two quick squeezes sets them forever. Try B-M Indenter Fittings and get more profits from each job!

ALL BRIEGEL FITTINGS ARE U. L. APPROVED AS CONCRETE-TIGHT

Order from Your Wholesaler!

All B-M Indenter Fittings are U.L. Approved as concrete-tight and for general use (File Card E10863). Also comply With Federal Specifications W-F-406.

UL

TELESCOPE BM SYSTEM

BRIEGEL METHOD TOOL CO.

GALVA • ILLINOIS

Warehouse Stocks in Principal Cities For Immediate Delivery!

CATALOGS and BULLETINS

Available Free to Readers of Electrical South upon Request

1048—Plug-In Strip
An illustrated catalog showing the complete "Plug-in" Strip line has recently been published by National Electric Products Corp., Pittsburgh, Pa. This eight-page illustrated brochure pictures the three and six foot standard lengths of the multi-outlet branch circuit assembly.

1058—Conductor Fittings
A handy, pocket-size catalog of their complete line of conductor fittings is available from Penn-Union Eletcric Corp., Erie, Pa. The 80-page catalog is thoroughly indexed and also has handy locator tabs for extra speed in use. Specifications and illustrations of each item are included.

1076—Modular Lighting
A 20-page booklet containing interesting and useful information about the "modular system" of lighting can be obtained by writing to the Mitchell Manufacturing Co., 2525 Clybourn Ave., Chicago 14, Ill.

1082—Lighting Equipment
Preprints of the F. W. Wakefield Brass Co.'s eight-page section on lighting which will appear in the 1954 Sweet's Catalog are available on request to Wakefield, Vermilion, Ohio. Included are descriptions of 11 major types of lighting equipment.

1086—Cable Connectors
Tomic Sales and Engineering Co., 4864 Woodward Ave., Detroit 1, Mich., now have available catalog sheets containing data on the complete line of their connectors, couplings, and cable connectors.

1088—Fittings and Fixtures
A 32-page illustrated catalog covering Killark fittings and fixtures is offered by Killark Electric Mfg. Co., Vandeventer and Easton Aves., St. Louis 13, Mo.

1090—Midget-Size Busduct
Complete information on Power Plugin, the new, midget-size busduct, is found in bulletin No. 720, available from Frank Adam Electric Co., 3650 Windsor Pl., St. Louis 13, Mo.

1092—Electrical Boxes
Steel City Electric Co., 1207 Columbus Ave., Pittsburgh 12, Pa., offers a catalog of their complete line.

1130—Conduit Fittings
The latest completely illustrative catalog on their diversified line of conduit fittings is announced by the Atlantic Conduit Fittings Co., 589 Atlantic Ave., Boston 10, Mass.

1136—Space Heating Guide
Cavalier Corp., Chattanooga 2, Tenn., has prepared a Guide for Calculations of Electric Space Heating. It is based on study of several thousand installations of electric heat and is a handy reference for calculating electric heating requirements and estimating operating costs. The booklet contains discussion, charts, and floor plan examples.

1150—Fluorescent Fixtures
Light & Power Utilities Corp., 1035 Firestone Blvd., Memphis, Tenn., has printed a new catalog of fluorescent lighting fixtures. The new catalog is divided into six sections, each printed in its own distinctive colors. First section is devoted to "General Data" and details of L&P manufacturing.

1166—Electrical Fittings
A 40-page illustrated catalog and price list on the Gedney line. Shown and listed are conduit, threaded entrance, SEC, EMT and ground fittings, and box connectors for both armored and non-metallic cable. Copies are available from Gedney Electric Co., RKO Bldg., Radio City, New York 20, N. Y.

1178—Remote-Control Wiring
Bulletin 16-200 is a 36-page manual describing layout and installation of remote-control wiring, and is available from General Electric Co., Construction Materials Dept., Bridgeport 2, Conn. Advantages and explanation of the system are followed by illustrated installation procedure.

1184—Approved RHW Wire
Bulletin No. 1018 describing first Underwriters' Approved Type RHW Wire, developed to meet the new National Electrical Code standards, is available from Simplex Wire and Cable Co., 79 Sidney St., Cambridge 39, Mass.

1262—Fluorescent Fixtures
The new loose-leaf catalog recently issued by Southern Lighting Manufacturing Co., 501 Elwell St., Orlando, Fla., contains complete diagrams, specifications, and descriptions for all fluorescent fixtures which they manufacture. In addition to the information on commercial, industrial, and school fixtures, the catalog also lists hangers, troffers, troffer accessories, and incandescents which are available from the firm.

ELECTRICAL SOUTH
806 Peachtree St., NE
Atlanta 5, Ga.

October, 1955

Gentlemen:

Please send me the bulletins and catalogs indicated.

(Print Plainly)

Name ..... Title .....

Company .....

Address .....

City & State .....

Circle numbers below. Bulletins and catalogs will be mailed promptly.

1048	1058	1076	1082	1086
1088	1090	1092	1130	1136
1150	1156	1166	1178	1184
1186	1190	1192	1200	1202
1204	1214	1218	1220	1224
1228	1230	1236	1238	1240
1242	1244	1248	1250	1252
1254	1256	1258	1260	1262

Reputation built on package

This firm has secured a volume of business by combining sales of wiring, fixtures and big-ticket extras

◆ IN SOUTHWEST MISSOURI, the Sechler Electric Co., of Springfield, Mo., has acquired quite a reputation for selling package electrical jobs in better-class housing in the $10,000 to $30,000 class. Ranging from one to fifty houses, the typical electrical contract engineered by this five-year-old concern involves not only wiring and light fixtures, but sales of big-ticket extras — custom-installed ovens, ranges, air conditioning, fans, etc.

"We've tried to avoid gaining a specialized reputation in any single type of electrical work," says Errett Sechler, Jr., owner. "House wiring accounts for 75 per cent of our volume but we're getting more and more industrial work."

Fixtures go with wiring

"In ninety per cent of the homes we wire we also furnish the fixtures," Mr. Sechler declared. "Display is the main thing in selling fixtures."

The 1,000 square-foot ceiling and wallside light fixture display at Sechler's includes more than 300 different types of lighting units featuring both modern and contemporary fixtures for use in bedrooms, baths, kitchen, living room, and outdoors. The bedroom choice alone covers over twenty different types of fixtures.

"Helping the homeowner select a fixture that will blend with the rest of the decor of his house is a prime objective," say Mr. Sechler. "A great many of our fixture customers are people who are buying their first new home and the selection of fixtures is a matter of great importance to them. We usually show them fixtures chosen by contractors who have built homes similar in design to theirs in helping them make their selections."

Extra installations

A typical Sechler house wiring job covers door chimes, kitchen fan (in fifty per cent of the cases), furnace, main entrance and often

An attractive light fixture display has helped the Sechler Electric Company gain a wedge in the new housing market in the vicinity of Springfield, Mo.

Mr. Sechler has found that the use of simple, easy-to-work-with parts is most valuable in speeding up the installation of house wiring. Work is never begun on any job until minutest details have been planned.

electrical jobs

by Grier Lowry

Errett Sechler, Jr., above, owner of the firm, finds that the storage of most-used parts in open-type bins is another way to promote efficiency.

SECHLER ELECTRIC CO.
1121 S. GLENSTONE—SPRINGFIELD, MO.

NAME:
ADDRESS:
JOB LOCATION:
DATE:
MATERIAL:
LABOR HOURS:
CONTRACT BY
AMOUNT OF BID $
BID:

MATERIALS USED	AMT.	PRICE	EXTN
1. 12-2 ROMEX			
2. 14-2 ROMEX			
3. 14-3 ROMEX			
4. 12-3 ROMEX			
5. 10-3 ROMEX			
6. 8-3 RANGE CABLE			
7. 14-2 UNDERGROUND			
8. W. P. WIRE—SIZE			
9. No. 6 BARE			
10. 12 TW			
11. 14 TW			
12. No. 6 TW			
13. 18-2 BELL WIRE			
14. SWITCH BOXES W/C			

MATERIALS USED	AMT.	PRICE	EXTN
40. TOGGLE BOLTS			
41. PORC. P. C.			
42. PORC. K. L.			
43. ENT. CAPS—SIZE			
44. ROOF FLANGE			
45. ROMEX CONNS			
46. ½" T. A. CONNS			
47. L. NUTS—SIZE			
48. BUSHINGS—SIZE			
49. STRAPS—SIZE			
50. NIPPLES—SIZE			
51. BAR HANGERS			
52. GROUND CLAMPS			
53. REDUCERS—SIZE			
54. CONDUIT—SIZE			

This form is filled in each day and is used as a detailed daily record of every job. By consulting the daily sheet, a new workman knows exactly what the status of the job is and what tools and materials he will need to complete his part on the installation.

includes central air conditioning.

The firm has a region-wide reputation for having the men with the know-how and the parts and equipment needed to do the job. The $15,000 parts inventory includes a substantial assortment of items in use by the home-fixit individual. The firm has accumulated a big stock of sockets for fixtures and lamps, electrical fittings, wiring for doorbells and chimes, etc.

Shortage system

Parts in heaviest use are conveniently located in a 10 by 14-foot wall section which is composed of fifty open bins, with name of part, cost, retail price, and stock number labeled on each bin. Here are such items as fittings, connectors, circuit breaker units, straps, plates, etc. The firm also maintains a big stock of light bulbs, bending tools, attic fans, and ten sizes of wiring.

"Every house wiring job is carefully planned in detail before work starts so there is no time wasted because the men don't know what they are supposed to do," explained the owner. "Location of switches, types of fixture and wiring to be used, placement of all service equipment is worked out in advance. An integral part of this pre-planning is to consult the utility on their regulations."

"We often show location of wiring entrances with crayon on the studding," he added. "Other times we work from architects' blueprints. We think it is important to never start a job until all phases of the planning have been worked out."

Simplicity of installations

House wiring work is speeded up considerably, this owner believes, by using the most simple and easy-to-work-with parts available. Mr. Sechler is constantly conducting research on new parts that will streamline house wiring jobs and cut down on labor costs. He feels a good electrical box, with knock-outs that remove easily, and that has screws ready for wiring, and that will line up with switches and receptacles with minimum effort, can save a lot of labor expense.

"The kind of bar used in mounting ceiling boxes means a vast difference in time and costs on 50-house projects," Mr. Sechler points out. "We use the simplest, most durable bar, with a hanger that adjusts well to the ceiling joints."

Special daily job sheets that re-

flect complete data on each job are regarded as a vital tool by this owner. On the front, the sheets provide space for name and address of builder, job location, time and material costs, amount of bid and contain an itemized list of all basic materials so that the ones used may be checked by the electrician on the project. On the back are sections for listing other materials used, names of men on the job, hours put in, rate of payment, permits needed, etc.

"Turned in nightly, the job sheets provide a complete day-to-day record," says Mr. Sechler. "We know what items are necessary to complete a job, what materials are brought back. If a new man is put on the work, he knows exactly what tools and materials to take along."

"The job sheets also keep us posted on the actual cost of each job," he added, "and serve as a useful guide in estimating future work. Often, we don't have time to submit a bill until two or three months after a job is completed, but when we do, all the information is available on the sheets."

Suggestive selling to homeowners and contractors has helped build a good volume in built-in appliances, particularly dishwashers, fans, ovens and disposals. Prominent display of these appliances in the showroom when they are seen by homeowners as they choose their light fixtures has created many impulse sales, according to Mr. Sechler. He believes in sticking to a few big-demand "built-ins" in order to focus attention of homeowners on items that interest them most.

Selling extras

In a great many cases, the firm adds from $200 to $400 to a job simply by showing this equipment to homeowners when the job is being figured. A four-burner built-in cooking unit that sells for $300 has strong sales appeal.

Among industrial jobs obtained by this growing firm are factories and school houses. Wiring school rooms and gymnasiums located in a 60-mile radius of Springfield, the average school house contract ranges upward from $14,000. Large commercial 40-watt fluorescent fixtures are usually installed in classrooms while reflector-type units are used in illuminating gymnasiums.

Recently completed was a shoe factory wiring project that involved the lighting installation plus wiring for 100 sewing machines.

Survey shows utilities favor home electric space heating

◆ MORE THAN HALF of the nation's representative power suppliers — utility companies, municipals and REA co-operatives — are favorable toward resistance electric heating for homes and commercial buildings in their service areas, according to a survey conducted by the Electric House Heating Section of the National Electrical Manufacturers Association.

A total of 420 of the power suppliers participated in the survey. Here is their reaction to the principal question asked — "What is your attitude toward complete electric house heating when properly engineered and installed?"—

Favorable — 244 or 58%
Neutral — 108 or 26%
Unfavorable — 68 or 16%

A breakdown of how these 420 participating power suppliers feel about electric heating, according to their respective type of utility operation follows.

Among the private investor-owned and operated electric utilities of all sizes and the municipally owned systems serving more than 25,000 meters some 78 power suppliers or 51% were favorable; 50 power suppliers or 32% were neutral; and only 27 power suppliers or 17% were unfavorable.

Among small municipals, serving less than 25,000 meters, 51% were favorable; 24% were neutral; and 25% were unfavorable.

Among the REA Co-operatives, 72% were favorable; 20% were neutral, and only 8% were unfavorable.

Thousands of installations

Manufacturers of electric heating systems estimate that there are conservatively about 300,000 homes completely heated by electricity in the nation at the present time.

Many of these may be in the Southern states and in the middle belt states where the survey shows the majority of power suppliers are favorable toward electric heating.

One of the principal reasons given by power suppliers for increasing interest in electric heating is linked directly with the growing summer air conditioning load. As air conditioning increases, many find that they are experiencing a summer rather than a winter peak load. Electric heating has been found as a highly effective means of bringing summer and winter electric loads into more favorable balance.

There are many resistance electric heating systems on the market, which fall into the following four main categories:

1. Wall-mounted radiant heating panels of glass, ceramic, aluminum, etc.
2. Wall-mounted convectors of the natural and fan forced types.
3. Baseboard systems that fall within the radiant and/or natural convection classifications.
4. Radiant heating systems using resistance wire imbedded in a plastered ceiling or in prefabricated panels for ceiling installations.

Electric heating advantages

Electric heating has a number of advantages which are "winning friends and influencing new customers" for all types of power suppliers. Seven of those which rate highest with users and suppliers follow:

1. It provides heat when and where the user wants it. Practically all types of electric heating systems provide individual room temperature control, so that the temperature can be controlled at the exact level desired in each area of the home. When a room is not being used, the heat can readily be turned down or can be turned off completely.
2. It offers cleanliness, convenience and flexibility. Electric heat is 100% efficient as all of the electricity consumed is converted into usable heat.
3. The initial installation cost is low.
4. There is little, if any, maintenance required.
5. It is essential for the truly all-electric home.
6. Electric heating balances summer air conditioning loads both for the consumer and the utility.
7. With proper insulation and the prevailing electric rates in many areas of the country, operating costs are reasonable.

How contractors can secure maintenance contracts

◆ "EDUCATING the industrial plant and commercial establishment in the safety and economy of a preventive maintenance program is the best way, we find, to impress them with the value of a maintenance contract," says Alfred W. Ward, electrician of Erwin Electric Co. in Salisbury, Md., who points out that this approach has gained his company an increased volume of 15 per cent this year over last. "Perhaps the breakdown of a machine caused by a burned out motor may afford the best opportunity of doing this—that is, when you have been called in on an emergency. But only education will teach them how to avoid such costly interruptions in production."

Located in an area of food processing and canning plants, Erwin Electric Company makes consistent effort to alert companies to the need for preventive maintenance through their large advertisement in the classified directory of the telephone book, in a weekly advertisement placed in the local newspaper, in a daily radio program that stresses from time to time electrical installation and maintenance.

Home show promotion

At the Farm and Home Show held recently in the local Armory, Erwin Electric Company set up a booth promoting industrial, commercial and residential wiring, displaying switch boxes, gears, motors, and other electrical equipment. Evenings, when visitors milled through the show, Erwin Electric men talked up wiring and maintenance.

But their best means of obtaining maintenance accounts is through personal contact, calling on businesses and plants and educating them to the lowered costs of operation and the extension of the life of equipment when an electrical service contract is in effect.

"It is not easy to convince people when nothing has gone wrong that they stand to gain from periodic inspections of electrical equipment. It almost takes a breakdown to make them see that neglect in cleaning and oiling may cost them a burned-out motor and work stoppage. It is human nature to let things go until something happens," explains Mr. Ward. "But continued effort brings response, and the more widespread the results of preventive maintenance become known, the more general will become the acceptance of preventive maintenance practices. And of course, we shall gain by it."

Selling the job

Mr. Ward cites an instance of his approach to plants. At one of the broiler processing plants where a machine breakdown had occurred, Erwin Electric was called in for repairs. Finding that the cause of the trouble was a burned-out motor that had not been cleaned or oiled in seven years, Mr. Ward pointed out that all electrical equipment required greasing once monthly, that it would save money to have monthly checkups since defects could be caught while they were still minor, that motors required an overhauling once yearly, and that life of equipment could be greatly extended with such proper care. In this instance a service contract was awarded to Erwin Electric Co.

Contracts are drawn up with a rate charge of $5 per hour.

In another account drawn up for a chemical plant, service includes monthly inspections and lubrications, yearly overhauling of the motors, cleaning, blowing out dust, packing the bearings as well as lubrication and oiling them. In

(*Continued on page* 89)

Making use of leftover materials

◆ WHAT HAPPENS to odds and ends of leftover materials brought back from electrical contract jobs? D. B. Clayton, Sr., and C. L. Teal, who operate Knight Electric Co., Birmingham, asked themselves that question last year and came up with an interesting answer.

"I decided to help out with the annual inventory," says Mr. Clayton, "and I was amazed to find so much stuff that we didn't know we had. It hadn't been separated in the shop and it didn't show up on stock records. We found that we had a lot of money tied up in what was then dead stock."

Solution of problem

Steps to remedy the situation were taken immediately and with effectiveness. All leftover material was added to inventory list even though some looked like it might not be needed in years. This was followed up by a practice in which the stock man checks each truck coming in off a job, lists material being returned, and puts it where it can be located.

"It is so easy to bring in the leftovers from a job and just dump them," Mr. Clayton explains. "We process them from each truck at the time it comes in, though there may be dozens of trucks returning from a big job before it is completed. It has to be done day by day, not piled up until the job is completed."

Check on materials

The list of material on hand is frequently revised. One copy goes to the desk of the estimator, another is posted in the stock room. Thus the estimator has before him at all times a list of usual material plus the various odds and ends left over from other work. When the estimator goes to the job to follow up with the job superintendent, he still has this stock list in mind. Together they may find a way of saving time and material that wasn't foreseen. It may save some material already bought for the job, or it may use something out of the shop.

In case the firm gets overstocked on one or more items they are listed and sent out to other contractors. "Of course we can only expect to swap dollars at best," says Mr. Clayton, "but we get dead stock into working capital and that is the main object in the whole plan."

"Fixture sales are helped when you can offer quick installation."

How I found my place

by Lois Fessenden
Fessenden Electric Co.
Blackwell, Okla.

A building contractor wants a quick estimate on plans.

"The trim out work on a new house can give the same satisfaction to a woman as a piece of fancy needlework just completed."

◆ A FANCY title would be nice, but until someone coins a new word, we shall just have to let it go by saying that I am a "female electrician." And even if the position does not carry a high-sounding title, I wouldn't trade jobs with anyone.

I would not have made this statement a few years ago, for then I was bored with my work which mainly consisted of answering the telephone, only to tell the caller, "I'm sorry, I don't know. I'll ask the electrician when he comes in."

Messenger to partner

Unhappily, I passed messages from my electrical contractor husband to the different customers and wrote job orders on the work sheets without an inkling of their meanings. An "amp" and an "ohm" were as strange to me as a foreign language being heard for the first time.

Now my husband and I are partners in our business, The Fessenden Electric Co., in Blackwell, Oklahoma. We do commercial and residential wiring and also operate an outlet for retail sales of wiring supplies.

When the internal revenue agent in this district called on us to give our store an account number for tax collection purposes, he asked if I had been given the partnership in the business as a gift. Truthfully, he was told, I had earned it.

Seeking experience

And I had earned my partnership. Earned it the hard way. For when my husband and the electrician working with him found that they couldn't shut me up with

in the electrical business

Code book dispels all doubt as to size of wire to be used on a grain auger. This wheat farmer will be satisfied that what he has purchased will be the right thing for the purpose he has for it.

"A thermostat tester and quick heat soldering gun are the two most important items on the repair work bench. The textbook on appliance repair served its purpose and has been put away. But, I'd hunt it up if I got in a jam."

vague answers about the workings of electricity, they gave me the task of nailing boxes and pulling wire. If they had ever heard that the female was supposed to be the "weaker" sex, they forgot it when we were on the job.

So I learned about the spiders and dust in the attics and under the floor of all the older houses and learned to look forward to a nice new construction where all I had to worry about was a "busted" finger or a broken fingernail.

Using the Code

Graduating, finally, to splicing up and more and more responsibility, I served a full time apprenticeship.

The National Electric Code Book has proved as exciting as any "Whodunit" when trying to ferret out the answers to a puzzling installation. And, especially, in the store while selling wiring devices, I have found the code book to be invaluable help. Because it doesn't matter if pages 288 and 305 (wire sizes and motor loads) are memorized, the simple act of holding the code book and reading the quotations aloud, seems to dispel any skepticism the customer may have.

And by helping the customer figure out the materials he will need for a particular use, we have been able to double our retail sales. For, as much as the electrical contractor may dislike the idea, the "do-it-yourself" craze has spread over into the wiring field, and the retail shop will profit by cinching these sales at home, rather than letting this large volume go to the mail order houses.

Repairs meet overhead

The inital purchase price of a textbook on appliance repairing, a quick heat soldering gun, and a tester for checking thermostats on household irons was repaid within a few days. Now we figure that the appliance repair business that formerly went elsewhere, will meet the basic overhead of the store.

Acceptance

Recently the crew that works with the local city-owned power company paid me the highest compliment. A new man on the crew, surprised at seeing a woman hanging light fixtures in the house under construction, teasingly offer to hold the ladder for me. The other men in the group told him to leave me alone, that I knew what I was doing.

Now that I do know the workings of the electrical field, and whether I am in the store helping a farmer plan the wiring he hopes to do for himself, fixing a burned out percolater, checking on a job in progress, or answering the telephone to discuss plans with a customer, I find my job the most rewarding and satisfying of any I have ever had.

Estimators and estimating

by James Dandelake
President, Miller Electric Co.
Jacksonville, Fla.

◆ THE PROFESSIONAL estimator is responsible to his employer for the proper preparation of an estimate to protect his employer's assets and to make money for the organization by which he is employed.

Many of the contractor-owner-estimators who by the nature of their business are having to worry about payrolls, accounts payable, accounts receivable, and many other factors that make the contracting business tick generally do not have the time or the patience to make good estimators and, at best, they are "guesstimators" from their practical experience.

My first advice to contractors is that they look over the conditions under which their estimators are working and see that they have provided them with the proper tools and conditions with which to work. These are just as essential to good estimating as the man himself. Here are a few points you should check:

Check working conditions

(1) Make sure he has a proper estimating table, a quiet place to work with glareless illumination from 100 to 200 footcandles. In most locations, air conditioning of the work space is essential and is a good investment.

(2) Make certain that he has good scales with white edges and engraved graduations and numbers; that he has both an architect's scale and an engineer's scale; and if he has the old Boxwood type scale in which the figures have been worn away, make certain that they are replaced. See that he has a good tally meter for counting various outlets, fixtures, etc., and that it is in good working condition and of a dependable make. The use of the tally meter will eliminate fatigue and produce more accurate results. Sure, all of us can count by ones but there is no need to tax the estimator's mind with this routine procedure when it is not necessary.

Timesavers pay off

(3) Make sure he has a good calculating machine and a good adding machine for his exclusive use. It is preferable that the calculating machine be of the automatic type. It is also necessary that the adding machine be of the type that produces a printed tape.

If you do not have a service contract with the dealer who handles the particular calculating machine or adding machine to insure that the machine is kept in good working condition and periodically lubricated and serviced in accordance with the manufacturer's procedure, you could very likely have a machine that is making repeat errors.

It is necessary that your estimator be thoroughly trained in handling the particular calculating machine, and that he obtain from the manufacturer several test problems that can be set up and run through the machine each day to insure that the machine is working properly, as any mechanical device can make errors.

(4) Make certain that the estimator has a supply of the proper kind of pencils and by all means have an electric pencil sharpener to sharpen the colored pencils. This will pay for itself in a short time and save breakage of the lead in these soft, colored pencils.

(5) Be certain that he keeps up his catalogs and that new catalog sheets are properly filed at all times.

(6) If you notice your estimator continually using a magnifying glass for reading things on his plans that you could normally see, then you should be warned that this man's eyesight is not adequate to be a successful estimator and you should see that he is sent to an eye specialist for proper fitting of glasses, if this is possible. If his eyesight cannot be corrected, then my advice is that it would be best for your company to replace him as an estimator.

(7) Another thing that is very important in the employment of an estimator is that of his personal life and habits. For an estimator to be of value to a company, his mind must be clear and free of worry. If he has conditions at home due to illness or other worries, it is then very important that these factors be removed. If it is impossible to correct or remove them, then at some time or another that man is going to cost you a lot of money.

Having him in the position of preparing for you basic information as to cost, it is important that you know these things. For your information from time to time we obtain credit reports so that we will be in a position of knowing whether or not there are any factors of this kind and whether the man is living within his income. Certainly, if a man cannot handle his own finances, he is a poor risk in handling company finances.

Mr. Dandelake, one of the outstanding electrical estimators of the South, has made a real contribution to the electrical trade through his clear, detailed talks on the subject of estimating. This article is adapted from a talk made recently to the annual convention of the Carolinas Chapter, NECA.

These views of estimators' quarters at Miller Electric Company, Jacksonville, Fla., illustrate the comfortable lighting, quiet surroundings, and ready availability of reference materials and other tools.

It is impossible in this short time to even attempt to tell you how to prepare an estimate, as the qualifications of an estimator require a thorough knowledge of many subjects, plus experience:

Estimator's qualifications

(1) He must know the National Electric Code almost word for word so as to be able to quickly detect faults in an engineering or architectural layout and thus avoid figuring a job in a way which will result in rejection, or spend money and time adding cost to correct for something he should have figured in the first place. Invariably, the specifications will have the well known escape clauses that protect the owner, engineer, or architect against their errors. And there are several court cases on record where the architect or owner won in the final decision.

(2) He must know the fundamentals of electricity, and its application to machinery and equipment thoroughly. His knowledge of this must be very broad, as he will be required in the course of his work to figure various types of jobs. He must also know good methods from bad. As often as he can, he should suggest changes that will give the owner a better job and save the contractor money.

(3) The estimator must have a thorough knowledge of many manufacturer's catalogs and equipment made by them, as well as know their products and application to the various jobs so that he will quickly know what materials are best and available, and where they can be obtained. He must also know the manufacturer's pricing methods, terms of sale, and discount schedule.

(4) He must know the practical

application of a job and have a thorough working knowledge of how the job will be built from the ground up. Without this knowledge, he has no conception of the field problems that might arise, and the problems that the electrician will encounter on the job and what type or quantity of material is going to be needed to perform the job under certain specifications. Therefore, if he has had no active field experience, the lack of this knowledge has placed him in a dangerous position and could cost his employer a lot of money.

(5) If he is to price the labor of an estimate, his knowledge of the job performance must be thoroughly complete, as none of the estimators' manuals available today cover the labor required for each specified item, and even in the NECA Manual certain adjustments are necessary from field experience to make them applicable. Certainly, no employer-contractor can expect an estimator to prepare an intelligent labor estimate if he has no conception of the amount of work and the various components involved.

Educational requirements

(6) The requirements I mentioned before are nothing more than what a good electrician or foreman should know. Of course, many of them, as you all know, do not attempt to apply themselves and know their jobs well. There are many estimators who think they know all the answers, never study, depend on engineered layouts and jobber salesmen for material and equipment know-how.

As far as the educational requirements of an estimator go, we have found that this is not of paramount importance. First class electricians who know their job well and have ambition to learn estimating have a great potential of making good estimators, particularly when estimating highly specialized jobs which require a lot of field know-how. Nevertheless, we have also found that a man holding a degree in electrical engineering, who has the initiative and ambition to apply himself and who has the willingness to work in the field as a timekeeper, material expeditor and any other such job that will keep him in close contact with the working forces who are installing the electrical work, in other words, a superintendent's flunky for two or three years, and then is brought into the office as assistant estimator or checker, will in the long run, make the employer the best estimator.

If he has the knack of making people like him, making the mechanics on the job like him, and has some sales ability and forgets that he has an electrical engineering degree, and remembers that he isn't superior to a first year apprentice, he will obtain information from the men in the field which will be more correct than would otherwise be the case.

Getting along with men

I have found that if an estimator or would-be estimator does not have this trait he will get little or no co-operation from the field forces, and they will do everything in their power to jeopardize his success. By this, I don't mean he must be a weak sister, but he must gain the confidence of the men under him, and he can only do this by knowing his job and the practical language of the electrician.

When he directs the foreman to do a job a certain way, he had better be sure he is right first; otherwise from then on he is a dead duck. And when you see or hear men coming to your estimator from the field for advice on how to do or handle a certain piece of work, we can almost be assured that you have a man you can depend on and is getting co-operation in the field.

(7) The successful estimator must know practically everything about the electrical business, depending upon the size and type of broad knowledge as commercial buildings, large and small, residential wiring, industrial plants, chemical plants, underground distribution systems, including concrete manholes, duct encasement, excavation, overhead transmission lines, overhead distribution systems, power plants, and as his company bids in these fields, it is expected of him to prepare for his company a cost of doing a job which may involve thousands of unknown factors.

Naturally, it is practically impossible for a man to know all this, but when he starts out to prepare an estimate in a field that is absolutely foreign to him and foreign to his experience, again I say he is treading on very dangerous ground because without having the experience in that particular phase of work, he lacks the ability to know all the factors that will arise and cost money. Should he make such an estimate and successfully come out, it would be sheer luck.

Granted that we all have the opportunity to do research work about various jobs and should your company expand into a field where it has not operated before, it would be my suggestion that several jobs under the category of this new expansion should be figured with the best possible figure and research and a cost estimate prepared and then go to the bid opening but do not bid the job.

After several such tabulations, you will then be in a position to evaluate whether you know enough about this particular phase of the business to stake all your employer's assets in this venture. Certainly, if the estimator or the company has not had actual experience in the field it cannot be anything except a guess.

Getting bid experience

What sound-minded man is willing to stake all his life savings and everything he has worked for to date on a guess? If he wins, he is one in a million. Maybe this is the reason you can count on one hand, or maybe two, all the electrical contractors who have passed from this world rich, or left an estate worth mentioning.

Even after such comparisons are made on a bidding of this type, you must stop and analyze the type of contractors who prepared the bids which you heard read, as to whether or not they are specialized and experienced in the field, as to make a comparison with one of the bidders who might not have had any more experience than your company would certainly not give you any foundation to decide whether your estimate was correctly prepared, as preparation "by guess or by gosh" is no criterion of the true facts.

In other words, there is so much to our business which is highly specialized in various phases of operation that all of these things have to be taken into consideration before any real judgment can be made. The way many bids are made today, very few are giving any consideration to the true facts and many are winding up after two or three years of hard work to find their auditors' reports showing them in the red with no money in the bank and nothing but a bunch of worn-out equipment, and no money to replace it. That is not successful contracting, and very poor estimating.

(*Continued on page* 40)

Know the law . . .

Contractor wins suit on union interference

by Arthur L. H. Street

◆ THE TENNESSEE Supreme Court, in a decision that became final in August 1955, okayed a judgment for $21,990 damages against an electrical worker's union, for causing a prime contractor to break a subcontract with an electrical firm on a hospital project, under threat that the prime contractor would be blacklisted on that job and others if he permitted the electrical firm to proceed. The court also okayed an injunction against further interference by the union with the complaining firm's contracts. (Howard v. Haven, 281 S. W. 2d 480.)

The decision was based upon statutes of Tennessee, and ELECTRICAL SOUTH readers in other states should discuss with their local attorneys whether or not the courts of their state would be apt to reach a similar decision in a case involving similar facts.

Basis for decision

The Tennessee statute involved in this case reads:

"It shall be unlawful for any person, by inducement, persuasion, misrepresentation, or other means, to induce or procure the * * * violation, refusal or failure to perform, any lawful contract by any party thereto; and in every case where a breach or violation of such contract is so procured, the person so * * * inducing" the violation, "shall be liable in treble the amount of damages resulting," etc.

Although the suit was brought against the union, its agents and a second electrical contracting firm to which the particular subcontract was awarded on termination of the plaintiff's contract, a jury decided that only the union was at fault. So, judgment was awarded against the union only.

On appeal from the judgment, the union's lawyers unsuccessfully argued that the union could act only through its business agents and that if they were not liable the union could not be liable. Referring to the Chancellor — trial judge — and to the Tennessee Court of Appeals which had reviewed the case on an intermediate appeal, the Supreme Court said:

Union's argument

"We think the Chancellor and Court of Appeals were justified in finding that Local No. 175, was an active participant; the others who were identified with the union, were taking part in the controversy, all of which resulted in a forcible breach of the contract. * * * Local No. 175, being a voluntary association, couldn't act except through its membership. Its conduct could be, and was, shown by circumstances indicating that it was a joint conspirator along with other named defendants. If the Chancellor and Court of Appeals believed Warlick (the general contractor) and that his evidence and other corroborating circumstances convicted * * * Local No. 175, the acquittal of Burnette (the union's business agent) as an active participant would not affect" the union's "liability. Williams was a representative of Local No. 175, as was Burnette. According to Warlick and Sara Ross both men voiced the threat of the Union to blacklist him, which would result in shutting down every job he had in Chattanooga and in Cleveland. When we consider what subsequently happened, and the facts and circumstances leading up to it, there is material evidence to show that complainants lost the contract because of the activity of Local No. 175, Burnette, Williams, and Cofer, who took over the contract at a bid of $2,000 above the complainants' bid."

"The record (evidence) discloses * * * that Local No. 175 was vitally interested in securing the Warlick contract for Chattanooga contractors who employed only Union workers. We think the weight of the evidence shows that Local No. 175 was the principal conspirator. Its members were the ultimate beneficiaries, regardless of any office they might hold in the Union. Those who suffered as a direct result of the breach of the contract were Warlick who had to pay $2,000 above what he had contracted to pay" plaintiff firm, and the firm which lost $7,330.

Seemingly, as a basis for an appeal to the United States Supreme Court, attorneys for the Union argued that to hold it liable in damages was to deny it the Constitutional right of free speech.

Supreme court decision

To this the Tennessee Supreme Court answered:

"The members of the Court respect in a high degree the rights of labor, both union and non-union. We take pride in observing our oath of office to uphold and defend the Constitution of the United States and the State of Tennessee. There is no denial in the opinion of the right of free speech, or any other constitutional right.

Rights of union members

"The right of the members of the union (Local 175) to refuse to work upon a contract with non-union workers is fully recognized, but in so doing there is no right to employ it as a means of consummating the union's unlawful purpose. We also recognize the right of union employees, as well as any and all other workers to quit work at any time, to strike, so long as it is conducted in a lawful and peaceable manner.

"The statute in question is not directed against any labor union or group of individuals but to 'any person,' who 'by inducement, persuasion, misrepresentation, or *other means*' procures the breach of a valid contract shall be liable to the injured party 'in treble the amount of damages resulting from or *incident* to the breach of said contract.' * * *

"It was never the intention of the Legislature that the courts should make nice and technical distinctions in any cause in order to favor individuals or groups and thus contribute to the emasculation of the statute."

Trade practices reviewed

◆ THE ELECTRICAL contracting industry, which is responsible for approximately one-tenth of the nation's annual construction work, gathered in New York City recently to review the effect of atomic power development and the vastly increased electrical use on their job of keeping America electrically modern.

Nearly 2,500 were registered at this 54th annual convention of the National Electrical Contractors Association. A special feature of the convention was the First National Electrical Exposition at which some sixty-two manufacturers displayed the latest developments in electrical materials, equipment, apparatus and tools.

"Modernize electrically"

The keynote of the convention was modernization, and the theme "Modernize . . . Electrically," was the subject of NECA's President Don B. Clayton of Birmingham, Ala., who pointed out that electrical use has doubled each ten years for the last two decades and that U. S. consumption of electricity is due to double again by 1964 to one trillion kilowatt hours a year. This tremendous growth imposes a huge task on the electrical contractors who supply the management organizations, application engineering, and labor necessary for the installation and modernization of electrical systems of all types — home, office, factory, laboratory, power plant.

Describing the problems of the vast construction expansion throughout the nation, President Clayton said that we simply are living in a new world and building it as we go along.

He bluntly warned the copper industry that it was pricing itself out of the market and that unless it made its supply more dependable and its prices lower, the electrical industry would switch more and more to aluminum for electrical conductor metal. He also called for a stepped up apprenticeship and training program and recommended that the industry increase its business development and advertising activities by many fold.

"Modernization, with the greatest potential appeal in the home where the housewife, in blissful ignorance, has been filling her rooms with an increasing flood of electrical appliances," he said. "Every home wants all of the labor and time savers, entertainers, and other electrical conveniences and necessities. Many of them are needed, and are bought as fast as the budget will permit. They are being urged from every source to buy, buy and the times are permitting them to do so. The only item that has been slighted in this rush for home modernization has been the basically necessary one — the electrical distribution system commonly referred to as 'the wiring.' The greatest attention it gets is when the cost of a new house runs a little high, they cut a few dollars — and the heart — out of the one thing that enables them to make a *home* out of their *house*. We of the industry have missed the boat in our failure to tell them a few simple facts that would save them grief and money later on."

Effects of automation

Mr. Clayton said that just about every one but the electrical contractor himself is starting or planning to use automation. He complained that the contractor cannot find automatic controls for the individual workman upon whom he depends to make automatic control installations in custom built installations. Mr. Clayton pointed out that automation automatically increases the electrical contractors' business because automation must be accomplished by electricity.

"It will require more and better trained electricians," he said. "It will require that contractors have more real engineers. . . . If we are smart we will organize and maintain qualified service crews to replace the present maintenance crews in the large industrial plants, for the existence of which we are largely responsible."

Mr. Clayton saw no serious threat in automation to the interests of labor. What skilled electrical labor automation replaces it will need to provide highly skilled repair and service technicians, he said.

Recounting the statistics of the present construction boom which is providing $42.5 billion in new construction this year and commenting on the social and economy moves and developments that are causing it, Mr. Clayton said:

"We are simply living in a new world, and building it as we go along. It will occupy the time and talents of the construction industry for some time."

Copper shortage

The shortage of copper and its high price were matters of grave concern to the NECA president. He was critical of the constant recurrence of strikes, shortages, and price increases which have placed the cost of the red metal at the highest level in 80 years.

"I do not believe," he said, "that the electrical construction industry will pay such prices if substitutes can be found. . . . Material savings will be made by the substitution of aluminum, based on the present prices of the two metals. . . . When you consider that about 45 pounds of aluminum will have the same current carrying capacity as 100 pounds of copper, you will see what our industry has facing it — 100 pounds of copper at $43 — if you can find it—against 45 pounds of aluminum at $10.98, just about four times as expensive. . . .

"Is there going to be sufficient copper? It certainly looks uncertain now."

Need for apprentices

Mr. Clayton said that the electrical contractor can only assure his future if he handles the apprenticeship problem "satisfactorily — not to our satisfaction, necessarily, but to the satisfaction of our customers." He estimated that it would require 24,000 electrical apprentices constantly in training to replace the present work force

at NECA's annual meeting

New and re-elected NECA officers. Left to right: President D. B. Clayton, Sr. hands gavel to new president Oliver F. Burnett, Jr. (office begins Jan. 1, 1956); NECA Vice-President Line Construction, Charles W. Moseley, Charlotte, N. C.; *F. E. Keith, Des Moines, Iowa, NECA District Seven Vice-President; Carl L. Teal, Birmingham, Ala., NECA District Three Vice-President; *Harold J. Hill, Wichita, Kansas, NECA District Five Vice-President; and Alfred V. Bartlett, Sr., Providence, R. I., NECA District One Vice-President. *Re-elected.

in the next 20 years. With the prospect of electrical use tripling and quadrupling in that time, a much larger training force is necessary.

Mr. Clayton remarked that he was frankly surprised at the effectiveness of the NECA business development and advertising programs. He said that the industry should seriously consider increasing its promotional outlays to close to well over $500,000 annually.

Committee proposals

An increased national advertising and sales training effort, plans for aggressive support of fair bidding legislation and for long-range coordinated effort with other mechanical specialty contracting groups, further development of management improvement courses and management aids, and a strong recommendation for labor representation on electrical industry promotional groups were among measures proposed by standing committees and staff officers of the association for 1956.

The standing committee reports were made to the NECA Board of Governors meeting during the convention. Staff officer reports were made on the opening day of the general membership meeting.

Executive Vice-President Paul M. Geary reported that 1955 has been a prosperous year for the industry with members' annual payroll exceeding $700,000,000, or more than $100,000 more than in 1954. Secretary-Treasurer Clint J. Harder reported that NECA membership on Sept. 30 totaled 3,487, the highest in the organization's 54-year history.

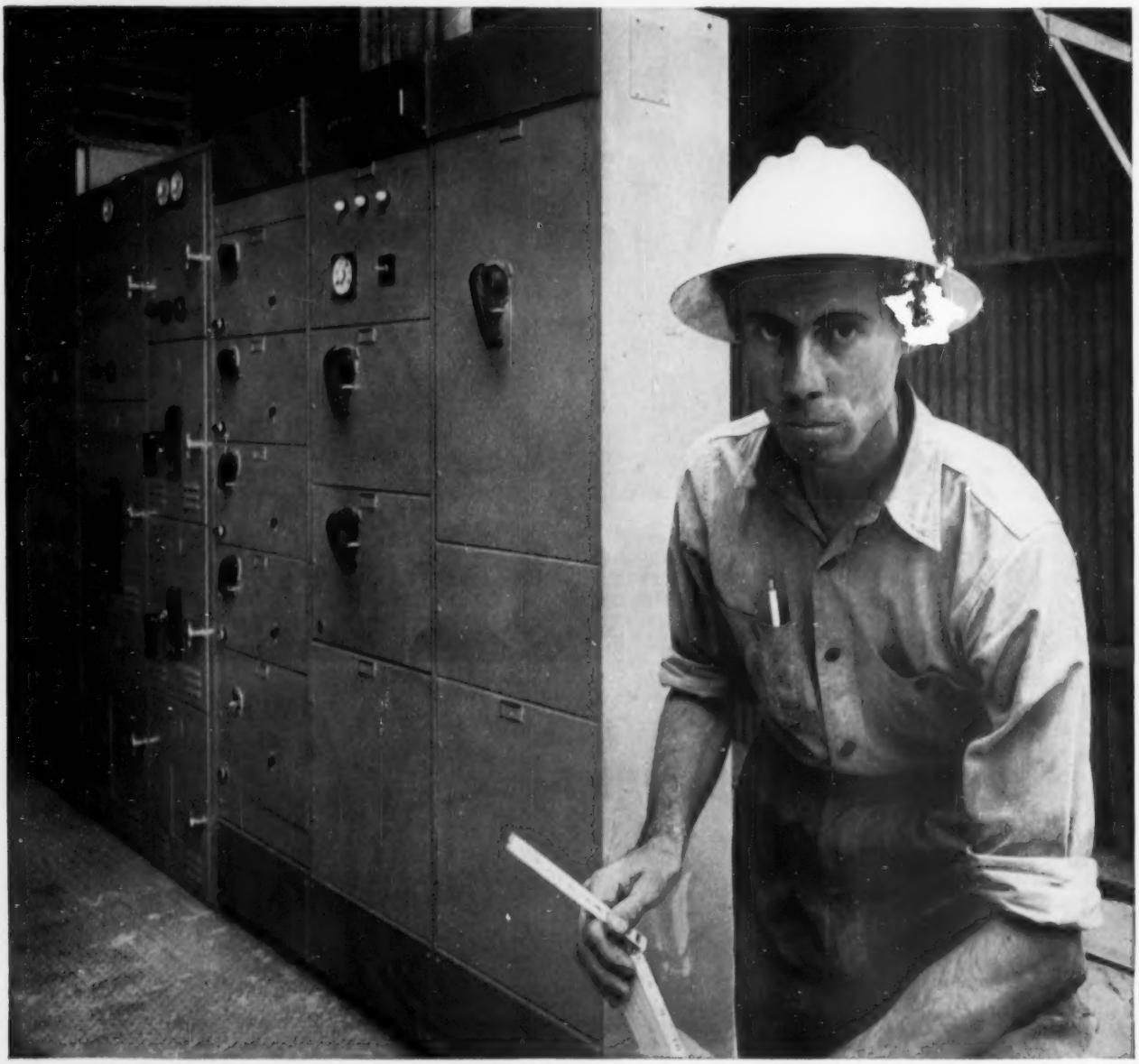
Chairman Arthur E. Bertke of the Business Development Committee recommended a five-part program for 1956 that includes contractor sales education, a broad prestige-educational national advertising program generally covering all aspects of the business with emphasis on industrial and commercial electrification; use by chapters of tested local promotional programs with emphasis on the sale of home electrical modernization; intensified direct sales contact with electric utilities and joint participation with other industry groups in promotions, particularly with the electric utilities.

Anti-bid shopping bill

Chairman Charles W. Moseley of the Governmental Affairs Committee reported that the Senate had passed the Federal Construction Contract Act (S. 1644) and that final enactment of this anti-bid shopping bill would be possible early next year if mechanical specialty contractors vigorously

Engineer and Contractor tell in their own words how they rate G. E.'s new motor control center

"Nothing in the field could equal this equipment," says plant engineer Henry Roth —"Our job greatly simplified," asserts electrical contractor A. G. Crunkleton.

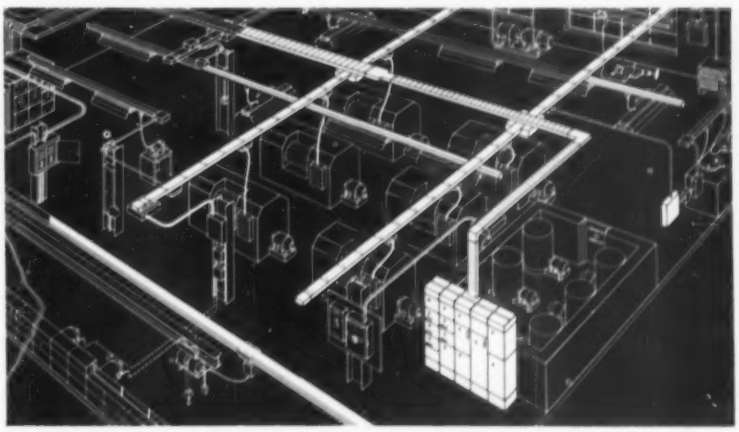


"At the North American Cement Company," says Henry Roth, "we recently replaced some G-E switchgear after 28 years of continuous operation. Having learned to expect this remarkably dependable kind of service from General Electric equipment, we replaced with G.E.'s Type DA7093 Motor Control Center that you see here. Heavy-duty limestone pulverizing like we are doing here at Hagerstown, (Md.) demands equipment that's durable and easily maintained. We can't tolerate even an hour of lost time in our around-the-clock operation, 365 days a year. That's one reason we chose the DA7093. In addition, this G-E design has built-in flexibility. For example, units can be interchanged to accommodate larger motors, and whole sections can be added to handle increased loads. Our new G-E Motor Control Center gives us the reserve capacity and unusual flexibility we'll need to keep pace with the growing and shifting requirements of our plant."

A system to meet both present and anticipated power loads. "Our job was to design and install a system that could withstand their rugged operating conditions and provide flexibility to meet increased future loads," says A. G. Crunkleton, president of Crunkleton Electric Company, Greencastle, Pa. "The General Electric DA7093 Control Center met those requirements and offers maximum protection to motors and circuits in the event of overloads or shorts. Our job has been greatly simplified and improved because, for one thing, the G-E Control Centers are designed for specific customer demands. The guesswork is eliminated. We work very closely with the G-E people, and they factory-fabricate the equipment to my customers' specifications. When I receive it, it's ready for quick and easy installation."

Shutdowns for maintenance practically eliminated. "Our maintenance electricians," says Mr. Roth, "were particularly impressed. Our inherent dusty working conditions have always led to high maintenance on open-type gear, but this situation has now been entirely eliminated because all working parts of the G-E Control Center are sealed off. After conferences with Crunkleton Electric Co. engineers, we all agreed that the G-E Control Center was the best in our particular situation. Nothing in the field could equal these units for day-in, day-out heavy-duty usage like ours." ***Engineered for maximum safety.*** "The DA7093 has already saved the life of one of our men," says Mr. Roth. Mr. Roth adds, "Since all breakers, relays and starters are within the cabinet, workers can't accidentally get into the wrong circuit. In addition, pilot lights and reset buttons are in open view on each door. And two further advantages are that the padlocked-type handle must be in the 'off' position before the door can be opened, and positive isolation is provided between one section and the others."

The Type DA7093 Motor Control Center (shown in layout) is an integral part of G.E.'s secondary distribution system, which also includes switchboards, busway, unit substations and panelboards. This "system engineered" equipment gives user and contractor seven *work-together* advantages—*1. True extendability* because G-E standardized components are especially designed for easy addition or relocation. *2. Easy-to-assemble. 3. No loss when moving.* "System Engineering" provides for practically 100% re-use of materials. *4. Complete relocation of loads* without rewiring. *5. Maximum electrical efficiency* from components designed to work together. *6. One source of supply* for all components. *7. Skilled planning service* from the G-E Engineer who is selling not just components but "System Engineered" equipment to assure installations with a built-in future. **Distribution Assemblies Department, Plainville, Conn.**



Progress Is Our Most Important Product

GENERAL ELECTRIC

supported it. He warned that opponents could be expected to use extreme tactics. The Committee suggested a greater coordination of the common-interest activities of mechanical specialty groups and to give broader effect and permanency to this machinery of the Liaison Committee of the Mechanical Specialty Contracting Industries.

Mr. Geary, as secretary of the Line Construction Committee, reported progress in the organization of line construction electrical contractors. Three chapters of this type of members were established during the year and more are in the making.

William J. Cour, director of Labor Relations, said that success in cooperative efforts with labor in the fields of arbitration of employer-employee disputes, apprenticeship and pensions suggested that further benefits to the industry would result if labor were made a full member of industry promotional activities. Labor has a tremendous stake in this move to develop new business because this development of additional profitable business means more and better job opportunities for the electrical workers.

Foreman training course

Charles P. Bobe of the Research Committee suggested that the new Job Management Course released this year as part of the NECA Educational Program constitutes an excellent training course for supervisory personnel, including job and general foremen. Foreman training has been a lively subject in the industry for several years and the Committee reported that a pilot run of the Job Management course conducted in St. Louis indicates it is an effective foreman training method.

William Beister of the Codes and Standards Committee reported that this year has been one of great activity due to the work on the new edition of the National Electrical Code. The Committee recommended that NECA cooperate with the American Iron and Steel Institute, the National Fire Prevention Association, and the Underwriters' Laboratories to make field tests of conduit fill requirements and the derating of current carrying capacities of conductors under varying installation conditions.

Chairman Emanuel Celler of the House Judiciary Committee today gave independent small businessmen some suggestions on how to meet competition from big business and promised them that Congress would wage unrelenting war on monopoly.

Pointing to what he called ominous signs of monopoly in the construction field and in atomic power development, Chairman Cellar told the 54th Anniversary Convention of the National Electrical Contractors Association at the Waldorf-Astoria Hotel that "policies and practices that foster monopoly in this vital field" must be nipped in the bud.

War on monopoly

"I stand by to help you in this regard," he said. "I am ever ready to chop off the heads of monopoly and undue concentration of economic power."

Mr. Cellar told the more than 2,000 small businessmen electrical contractors that although the anti-trust laws were designed to curb bigness, they applied to "the little rascal as well." He said he wished to emphasize that point because he knows that small businessmen, confronted with unfair economic conditions imposed on them by the collusive combinations of big business, are inclined to "fight fire with fire." He counseled against that "foolhardy mistake." Instead, he suggested that a key to survival of the small businessman lies in his proper use of the machinery of the modern service-type trade association.

"I am convinced that through the machinery of the modern, service-type trade association, properly conducted, the small businessman has the key not only to survival but to the progressive development of our dynamic economy," Chairman Cellar said. "I have in mind a trade association providing management services to the small, independent businessman so he can operate on a basis of equality with Big Business which has its own resources to provide itself with these services."

He noted that studies have shown the lack of management know-how is the greatest single problem of the small businessman. Noting that NECA was set up along the lines he recommended and was making important progress, he added:

"It would seem to me that you have the means as small businessmen to meet most of these seemingly overwhelming problems of Bigness. The big job ahead is to use these progressive tools, work at the job diligently and keep your ranks open to virile, decent and progressive newcomers so you will have the collective size and strength to do the job the public looks to you to do.

"I have great confidence that the Little Man, facing the problems squarely, honestly and resolutely, and using the tools that proper cooperative action can provide, can and will survive and, indeed, prosper in this Sea of Bigness."

Chairman Celler emphasized that he was not against bigness just because it was big.

"Big enterprise, when conducted in an enlightened manner so that the public interest is uppermost, where there is made manifest some social consciousness and not mere money grabbing, is deserving of as much praise as small business similarly conducted," he said. "Small business holds no monopoly on virtue. And Big Business holds no monopoly on wrong doing."

To express his philosophy he quoted from Shakespeare (Measure for Measure"): "O, it is excellent to have a giant's strength; but it is tyrannous to use it like a giant." He said he did not want an economic milieu where one could hear the following: "Every man for himself, said the elephant, as he danced amongst the chickens."

Local competition needed

Chairman Cellar said that as far as he was concerned any undue curtailment of competition should be unlawful if conducted in a state, city, township or county; that it need not be nationwide.

Turning to the construction industry, Chairman Cellar noted some dangerous aspects of monopoly in the prevalent unfair trade practices in the construction industry known as "bid shopping" and "bid peddling" involving particularly the broker-type general contractor. He said that legislation (S. 1644) dealing with this matter was introduced in the Senate by 17 senators in the first session of the present Congress and was passed by the Senate in July. It is pending before his Committee as are similar bills introduced in the House.

"I am keenly aware of the destructive erosion of the economic and moral fabric of the business community that comes with the widespread existence of unfair trade practices. And I fear that too much of our business today

Sylvania Mercury Vapor street lighting at Huntington, California

SYLVANIA MERCURY VAPOR—

modern solution to street lighting problems

MOST EXPERTS AGREE . . . your best buy in street lighting is mercury vapor, for both performance and economy. And for all-around dependability, Sylvania Mercury Vapor lamps are the choice of experts!

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is interlaced with such uneconomic and destructive conduct. I realize, too, that the independent, ethical small businessman has the least chance of any to survive in such a turbulent sea. The unethical big business operator, with greater resources, more staying power, and the ability to command the more expert connivers, will be the one under such conditions most likely to come out alive even though he be tainted. So this, too, is an aspect of monopoly."

Don Clayton honored

One of the highlights of the association convention was the award to Don B. Clayton, Sr., president, Electric Constructors, Inc., Birmingham, Alabama, the Contractors Medal and Purse, given under the James H. McGraw Award for Electrical Men.

Mr. Clayton received the award for his dedicated personal leadership and industry statesmanship which have brought constructive recognition of the vital role of the electrical contractor in the broad activities of the electrical industry.

The panel of judges who recommended Mr. Clayton and Mr. Freund for recognition under the Award consists of: R. W. McChesney, Harry Alexander, Inc.; E. L. Buttner, Scott-Buttner Elec. Co., Inc.; E. C. Carlson, Carlson Electric Company; W. E. Frazer, H. B. Frazer & Company; and H. A. Webster, T. Frederick Jackson, Inc.

The citation pointed out that Don B. Clayton, Sr., "as president of the National Electrical Contractors Association, during the past four years, undertook the difficult task of extending his leadership through personal contact with all districts and chapters of the association. A rigorous schedule of travel, communication, and participation has permitted his individual initiative and enthusiasm to be directly transmitted throughout the membership. During the same period he has accepted the difficult and challenging role of spokesman for his association in the meetings and activities of related industry groups, a task which he has carried out with great distinction and with a keen appreciation of the responsibilities of industry statesmanship."

Contract payment studied

An important action taken by the association at this convention was its resolution which called on the construction industry to end the retained percentage abuses and abide by a more equitable practice on holding back payments on construction contracts.

The Association said that this practice is drying up some $2 billion annually in construction credits and is being used by big owners and large general contractors to make small business contractors and suppliers finance large construction projects. A resolution asking the architects to take immediate steps to institute a suggested procedure for the proper handling of these payment holdbacks which a majority of the industry had approved earlier in the year was adopted.

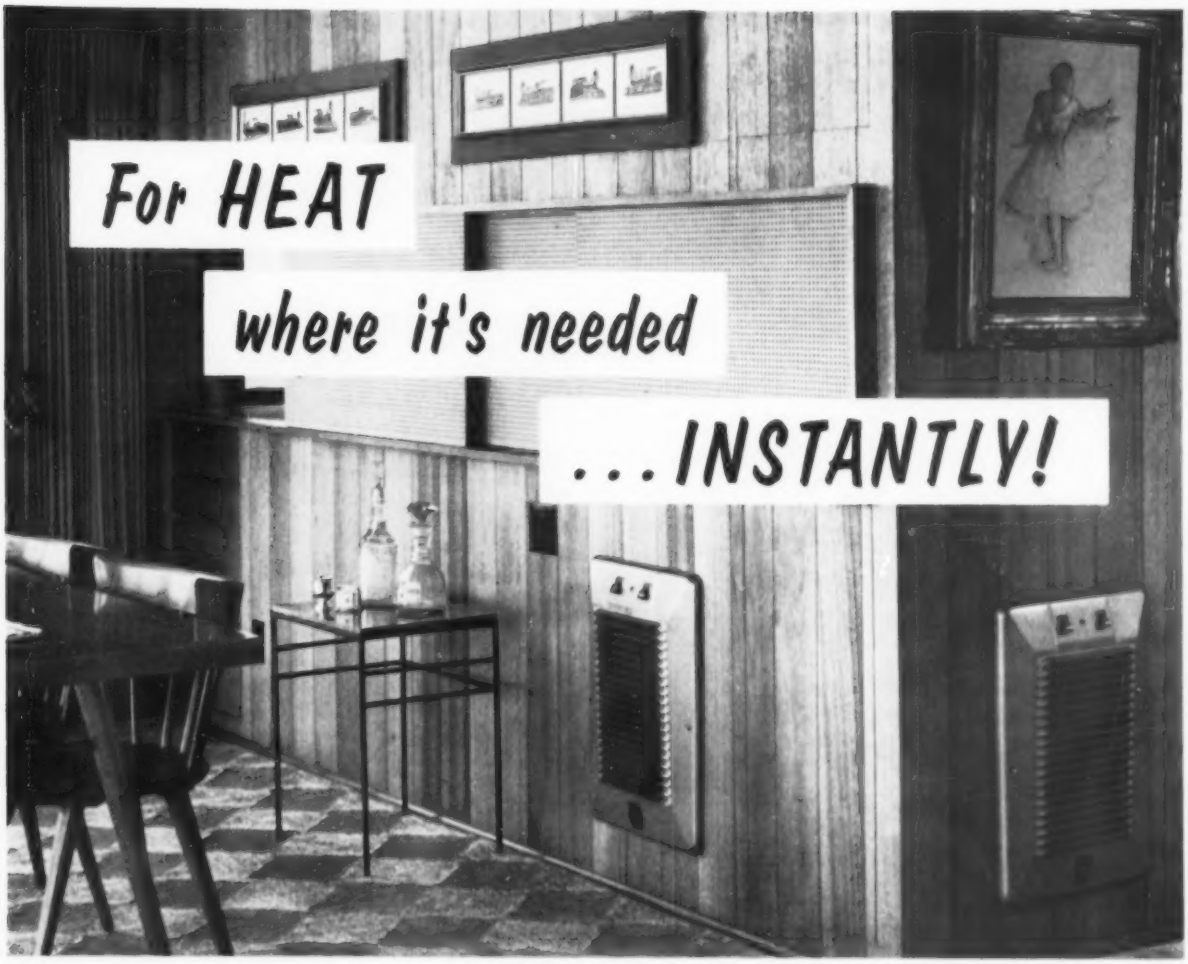
New officers for 1956

Oliver F. Burnett, Jr., president of Kelso-Burnett Electric Company, Chicago, was elected president of the National Electrical Contractors Association for 1956.

As chairman of the NECA Business Development Committee from 1951 through 1954, Mr. Burnett

(*Continued on page* 88)

Left to right: D. B. Clayton, Sr., president of NECA, receiving the McGraw Award for Electrical Men, from Harold A. Webster, New York City, a member of the Committee of Awards.



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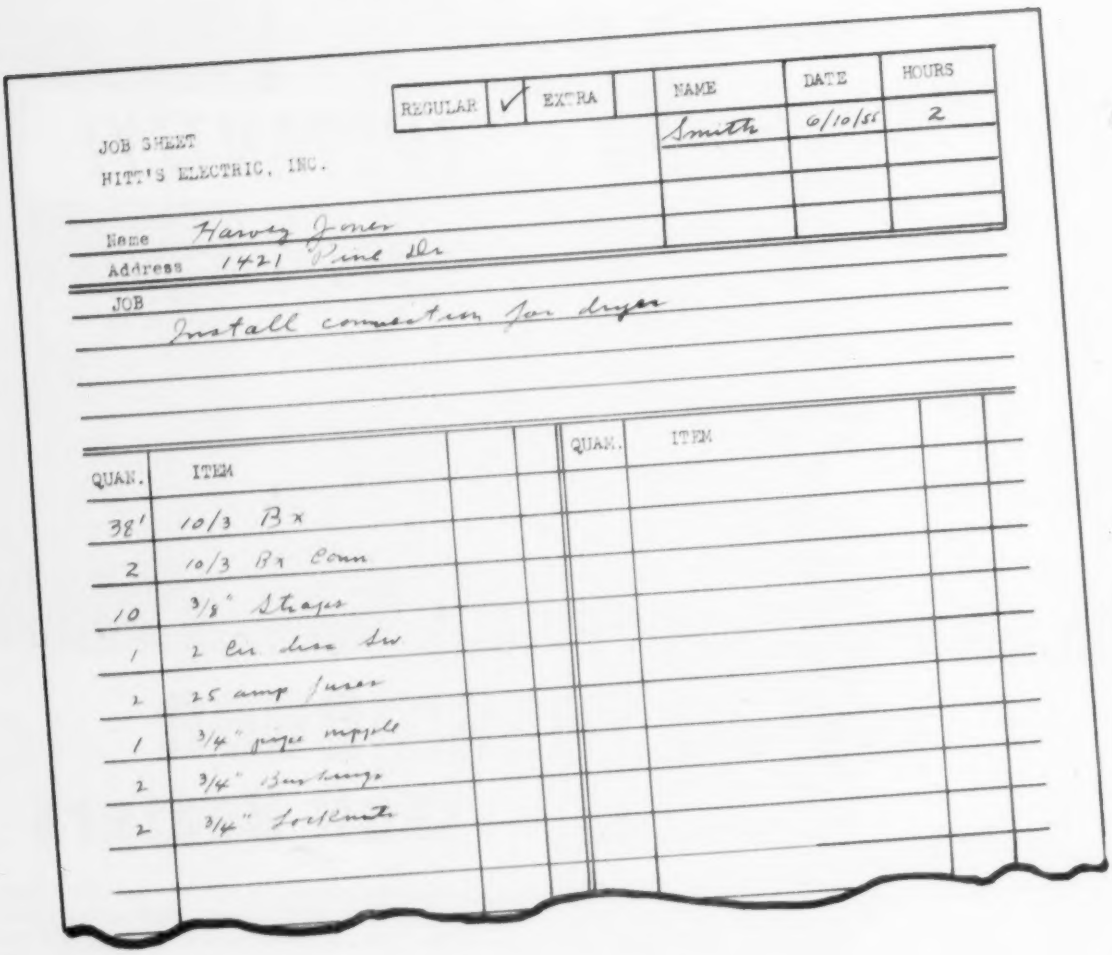

REGULAR ✓ EXTRA

NAME	DATE	HOURS
Smith	6/10/55	2

JOB SHEET
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Name Harvey Jones
Address 1421 Pine Dr

JOB
Install connection for dryer

QUAN.	ITEM
38'	10/3 BX
2	10/3 BX conn
10	3/8" Straps
1	2 cir disc sw
2	25 amp fuses
1	3/4" pipe nipple
2	3/4" Bushings
2	3/4" Locknuts

QUAN.	ITEM

◆ **AN EFFICIENT SYSTEM** of job recording, like a good bookkeeping system, should tell you whether or not you are making money, and let you know just what a job is costing you in time, labor, and materials. It furnishes you with data for classification of jobs so that you know whether you are overbidding or underbidding on certain types of work. It gives you the status of each job in progress. A good system is so important to the success of an operation that records can either make you or break you.

Since a one-man operation lacks time for detailed breakdowns on each job, it is important to have a system so streamlined that records provide the vital answers without requiring excessive paper work.

Choice of plan

We at Hitt Electrical Service experimented with a number of job record systems before arriving at our present plan, and we believe that we have reduced paper work to a minimum without sacrificing any of the answers. We like our present plan, and find it satisfactory for one-man operations.

Our system centers around a daily work sheet filled out by the mechanics on a job. The name and address of the job and description of the work to be done, head up the sheet. Then follow the date, name of mechanic, number of hours of work, what he did on the job, time spent, plus the list of materials used. Time is computed from the minute a mechanic leaves a previous job; thus, travel time is charged up to the new job.

Daily work sheets are turned in every evening by the mechanics and priced according to National

by Edward H. Hitt

President, Hitt Electrical Service, Inc.
Rockville, Md.

Pricing Service by our bookkeeper. A time book is maintained in which each man's time is recorded for payroll purposes. Under the date and mechanic's name each job and the amount of time he spent on the job is put down. We find this time book invaluable as a check-back record. Any question that arises with regard to the man's time is settled by these records, which are kept on file for three years.

Filing system

When daily work sheets come in on small miscellaneous jobs, a statement is sent to the customer the following day, and a record placed in our unpaid miscellaneous file. When payment is received, this record is removed from the unpaid file to the Paid Miscellaneous file and kept there for one month. When the month expires, it is removed to an upstairs file, and filed by date. Filing the Miscellaneous Paid record of small jobs under month payment was received, we can readily put our hands on this information if any complaint arises from the customer on a defect or a breakdown.

On large jobs we maintain an active job file of commercial, industrial and residential construction. These comprise a series of folders, each under the job contractor's name or individual customer's name. A time record is kept of all labor going into the job and on this time sheet we record materials ordered, detailing source of materials, purchase date, invoice number, and retail prices.

Status of job

We can tell at a moment's glance what the entire picture is on any particular job. We know the amount of time and materials put into it to date, what the costs were, what was paid, a breakdown of number of hours, amount of material and cost, balance still to be collected. With a moment's calculation we can tell whether we are running ahead or behind profit-wise. We often use these files in checking our bidding on filling station, warehouse, and housing project jobs.

In a 90-home development we were doing, we spot-checked every 20 houses to learn where we stood on labor and materials. We expected the men to pick up on labor and materials as the job progressed and they learned faster ways of doing things. But our records reveal at once whether we are taking too much time or whether we have

(*Continued on page* 89)

The streamlined record system at Hitt's, in Rockville, Md., cuts excessive paper work to a minimum and serves as an index to any job the company is undertaking.

As soon as a job is completed, Hitt's Electrical Service has its mechanics fill out a daily work sheet describing the job and how long it took.

Case histories in labor relations

How would you have handled these labor grievances?

This roundup of day-to-day problems in labor relations provides an opportunity to test your judgment as to what is right and wrong. Each incident is an actual grievance that went to arbitration. Names have been changed for obvious reasons, but readers may obtain actual citations on any specific case by writing to the Editors, Electrical South.

Worked on day off?

◆ *Must an employee be paid if he is called in on his day off to discuss with his boss mistakes he has made in his work?*

What happened

Oscar Janidle was home looking at television. He suddenly got a call from his supervisor. The foreman was good and sore. It seems that Oscar had made a bad error in his work that day.

"You come in tomorrow. I want to talk to you about it," the supervisor boomed into the phone.

"But tomorrow's my day off," pleaded Oscar.

"You do as you're told or you'll have lots of days off," the supervisor answered, and hung up.

The next day Oscar came into the supervisor's office and got a good dressing down for his mistake. He was told that if he committed another such serious error he would be disciplined "but good."

During the conversation the supervisor and the worker also went over the latter's work history. The whole business took about an hour. The next week, Oscar put in a request for 4 hours "call in pay." The company had a policy that where an employee is asked to report for work he shall be guaranteed at least four hours pay. The management turned down Oscar's demand. It said he was *not* called in to work.

He was called in to be "bawled out." Oh no, Oscar said. A man's day off is sacred, and if the company calls him in for any reason whatsoever, the man must be paid.

Was Oscar: Right ☐ Wrong ☐

What the arbitrator ruled: "An employee's job obviously includes more than the mere physical performance of certain objective tasks of operations: it includes his participation as required in the process of inter-communication between his superiors and himself. The giving and receiving of orders and instructions is only one phase of the supervisory process. Another and equally important phase is the sound administration of discipline. Thus the employee is 'working' when he is listening to words of warning or reprimand. He is being questioned, warned or reprimanded in his capacity as an employee about his performance as an employee. If he is required to participate in a conversation looking toward the improved performance of his assigned tasks then such participation is part of his job and he is entitled to be paid accordingly. When Janidle was called in to discuss his mistake he was to all intent and purposes working and is entitled to 'call in pay' of four hours."

The editors regret that they cannot undertake to answer any hypothetical grievance problems.

Drinking on the job

◆ *Can you discharge an employee for drinking if for 28 years he "occasionally" came to work "tipsy" but was never disciplined?*

What happened

Mr. X came back from lunch one day and it was obvious to his foreman that the worker had one too many. In fact, X himself said he felt a little sick and wanted to go to the locker room. This was no news to the supervisor. X had 28 years of service with the company, and though a good worker, he had to be excused from work once in a while because he "hit the bottle."

On this occasion, after X had been in the locker room for a few minutes, a fire broke out there. Although X denied that he had anything to do with the mysterious blaze, management had strong suspicions. At any rate it felt that it had put up enough with X's inebriating ways, and fired him.

X took his case to arbitration and made a defense based on remorse and sentiment. He said:

1. I did wrong and should be punished for coming in drunk, but I had nothing to do with the fire.
2. I should be punished, but not fired.
3. I've been with the company for 28 years and deserve a kinder fate.
4. I'm 58 years old and if fired will lose many pension benefits.
5. I'll never be able to find another job with this discharge on my record.

Management, in its answer said

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it didn't relish the idea of letting X go. Its decision to do so came after long and hard deliberation. But, the employer maintained, X was warned several times, even though no disciplinary action was taken. And the fire in the locker room, though denied by X, gave management the feeling that X's excesses were reaching the dangerous stage. And, the fact that the company was tolerant for 28 years does not establish a precedent.

Was the company: Right ☐ Wrong ☐

What the arbitrator ruled: "The arbitrator is convinced that men in today's mills and shops should and must remain always on the alert, and that means steady and sober at all times, for their own life and safety as well as for the welfare of fellow workers. Man of the 20th Century has developed a technological pattern that not only produces mass materials, but it also is capable of mass human destruction, if not at all times directed by men of steady minds and muscles. Therefore, today's union and industry are working cooperatively in every way to adjust employees to job demands. Intemperance in the use of liquor to the extent that it makes a worker unsteady on his job is never condoned by union or company. The arbitrator is in full sympathy with the company in the discharge of Mr. X. The arbitrator's award is, therefore, based on the belief that a man 58 years of age ought to know that engaging in extremes generally means ending on the wrong side of the ledger. The arbitrator is well aware of the problem faced by a discharged man of 58 and the benefit loss of his OASI account schedule; yet when representatives of a company give a man rational advice when he is a victim of extremes, and he repeatedly ignores them, the only alternative a Company has is to discharge him, and the arbitrator sustains the discharge of Mr. X."

Treat customer right

◆ *Is "antagonizing a customer" just cause for discharging a salesman with a good ten year record?* ◆

What happened

Peter Reynolds was a good salesman. So good, in fact, that he was given an important account to service and did so without much supervision from the head office. One day when Reynolds came to visit the account he found that the company had a strike on its hands. There were pickets outside. Reynolds got into a conversation with the pickets and was overheard to say to them: "I think you fellows are in the right. If I were in your shoes, I'd be out on strike, too." The salesman then left, refusing to cross a picket line. He was a member of a union himself, and later said that it was against his union's policy for members to cross picket lines.

A few days later Reynolds returned to service the account and discovered that the strike was still on. He again engaged in conversation with the pickets. The strike was finally settled, but when Reynolds showed up, the account refused to do business with him. In fact, the customer sent a strong note to Reynolds' boss stating that he had interfered with the strike, and that it didn't want him coming around. Further, they wanted him fired.

The company discharged Reynolds for "antagonizing a customer." The case came to arbitration. Reynolds put in the following defense:

1. His discharge had nothing to do with his job as a salesman.

2. The strike is all over and the employees who engaged in it were all taken back. There is no reason for post mortems.

3. The customer had no reason to be so exercised. A man has a right not to cross a picket line as an "individual freedom."

4. No matter how important a customer may be, the company had no right to give in to the demand that he be fired.

The company's defense was simply that Reynolds showed such bad judgment in his behavior that they couldn't be sure he wouldn't antagonize another customer if such a situation came up again. Then again, management maintained, he overstepped his bounds. To cap it all, the company held that it is better to sacrifice a salesman than a top customer.

Was the company: Right ☐ Wrong ☐

What the arbitrator ruled: "Reynolds' refusal to cross a picket line may be considered an individual right in this situation, implying a minimum of interference. It is an impersonal act of restraint which both labor and management normally expect in this area and does not connote individualized hostility. But the customer found fault with Reynolds because in its judgment he extended this form of institutional impersonal advocacy and sharpened it by public expression of sentiment. And he did that as an employee of the company he worked for. Mr. Reynolds therefore alienated the customer to the point where he was refused permission to come back as a representative of his company. He thus jeopardized the relations between his company and the customer. I therefore find the discharge proper."

Estimators and estimating

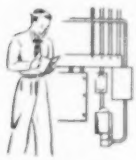
(*Continued from page* 26)

The NECA Manual of Labor Units, which is available to members, is one of the best sources of average labor units established over many years, and we have heard many contractors and estimators say that they could not get a job or they could not be low if they used the units set forth in the Labor Manual. This is not true, for if the labor units in the NECA Manual are properly applied and the estimator has a thorough knowledge of the system, he will come up with man hours that are very close to what it will actually take to do the job.

Back in the days before NECA was as strong an organization as it is today, and the Estimating Manual very incomplete and very general in nature, we found very little competition on jobs that required any degree of skill.

I attribute no small part of the number of bids that we have on jobs today to the advance made in the NECA Manual. Some bidders strive to do one thing at a bidding, and that is to be low. Frankly, I am not concerned with being low, but I know we have to be low to get many jobs. However, I am concerned with the character and type of contractor in the bidding, and primarily concerned with one thing, how the job will come out in the end. Nothing else matters in the end because if the job does not make a decent profit, we would have been just as well off without having the contract.

(*This article will be continued in the next issue of Electrical South.*)



Maintenance engineers' notebook

Surge protection for rotating machinery in textile plants

by Edward Beck

Westinghouse Electric Corp.
East Pittsburgh, Pa.

◆ THE 550 VOLT circuits feeding motors in textile mills may be subjected to surges of several origins. They may originate in the circuits themselves, such as transient overvoltages produced by arcing faults to ground, or surges caused by switching. Or they may be of external origin such as lightning.

Surges of internal origin in 550 volt of lower systems are seldom sufficiently high to endanger the motor insulation. The insulation to ground of 550 volt motors is tested at twice normal plus a 1,000 volts rms or 2,100 volts. The voltage to neutral of a 550 volt circuit is 320 volts. 2,100 volts is almost seven times 320 and such a voltage produced by arcing or switching is most unlikely.

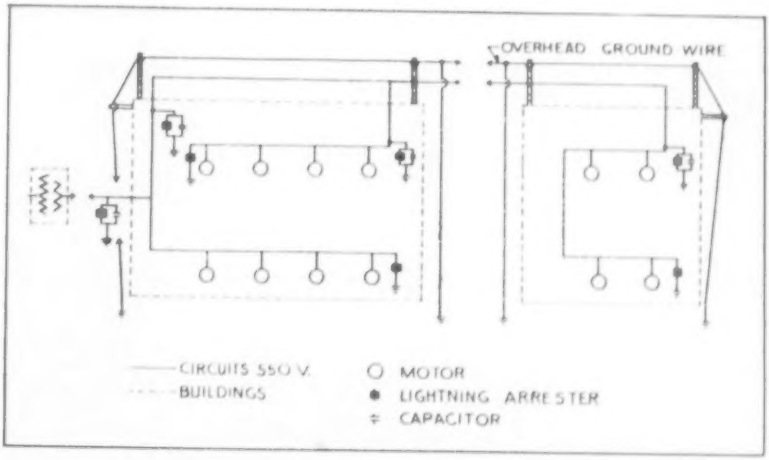
It is conceivable that the rate of rise of some switching surges or transients produced by arcing faults may have rates of rise that can endanger turn-to-turn insulation. The rates of rise will be limited considerably by capacitance alone without the necessity of inductance except that inherent in the circuit.

Most of the 550 volt circuits are delta and ungrounded, for certain operating reasons. On ungrounded circuits, an arcing fault on one phase to ground can produce high repetitive transient voltages from the other phases to ground, particularly if the fault is in solid insulation. This high voltage can cause insulation failure elsewhere, that is an arcing fault at one place may cause another insulation failure at another, on ungrounded neutral circuits. Such cases definitely have occurred on 2400 and 6900 volt delta circuits, and they are a serious objection to delta ungrounded systems of those voltages. We doubt that such cases occur on 550 volt delta circuits, but we would appreciate any expressions from those who have had operating experiences.

The contingency can be prevented. The high voltage resulting from arcing faults can be prevented by grounding the circuits; either by grounding the neutral solidly or through resistance, or by grounding by means of transformers and resistance. This practice is definitely recommended for higher voltage circuits; it is in our opinion not important on 550 volt circuits.

Ungrounded circuits

On ungrounded circuits the amplitude of voltage can be limited by arresters. If these internal voltages do cause trouble, then arresters and capacitors will prevent it unless the insulation has been de-



Recommended protection against electrical surges applicable to 550 volt circuits such as found in textile manufacturing plants.

(1) If the circuits pass out of a building, arresters and capacitors at the entrance and additional arresters at the ends of the circuit, if the circuits are long. In the case of short stubs at the end of a long feeder, these arresters can be located at the tap to the feeder.

(2) If the circuits are wholly contained in a building but the building is of the kind where protection is required, arresters and capacitors at power source and ends of long circuits.

This article is adapted from an address before the recent N. C. Textile Conference, at Raleigh, N. C. The first part of Mr. Beck's address discussed the fundamentals of protecting rotating machinery against surges. The latter part, covered in this article, dealt with specific problems in textile mills on 550 volt circuits.

teriorated to the point where it is going to let go pretty soon anyway. Even so, the use of arresters and capacitors would lengthen the life of motors with deteriorated insulation and thus their use might well be justified in any case. For these voltages of internal origin it is not necessary to apply protective devices on all of the motors on the circuit. In fact a capacitor and an arrester located anywhere on a circuit of short length or at the extremities of long circuits should be sufficient. A short length of circuit for this purpose, we consider something of the order of 200 feet or less.

Lightning surges

Surges produced by lightning are quite another matter. The voltages produced by them can be many thousands of volts. If not limited by insulation flashover or puncture or by arresters they can be many millions of volts; in fact no transmission lines, even those operating at the highest voltages, 330 to 400 kilowatts have sufficient insulation to be immune to lightning flashover without some form of protection. In low voltage circuits, voltages produced by induction from nearby strokes not actually contacting the circuits can be dangerous to the insulation. In 550 volt circuits they are a significant danger because induced voltages will occur more frequently than direct hits.

Where the circuits are exposed to lightning, capacitors and arresters definitely should be applied to the circuits. Exposure depends on the kind of building and on the kind of circuit. Although it is not easy to classify buildings and circuits into simple groups, a general division will be made for purposes of discussion, bearing in mind that local conditions and modifying factors may influence the program.

From the standpoint of construction, buildings can be segregated into two principal groups.

(1) Buildings of wood or masonry: (a) With circuits in open wiring. (b) With circuits in metallic grounded conduit or sheaths.

(2) Buildings largely of metal: (a) With all circuits contained completely within the building. (b) With circuits passing outside the building.

If a building of wood or masonry is struck by lightning the material opposes high resistance to the flow of lightning current. This produces high voltage and the result may be shattering of the material or flashovers from the building to metal connected or coupled to earth, such as pipes, machine frames, or circuits. This has happened.

Open wiring in such buildings is exposed to lightning voltages that are dangerous to equipment insulation, whether the circuits are wholly in the building or pass outside. If they do not pass outside the probability of trouble is less, but they are still subject to disturbances from strokes to the building or by induction from nearby strokes. Such circuits will benefit from lightning protection.

If the wiring is in grounded metal conduit, the chances of trouble are probably negligible. The conduit must be well grounded at intervals. A conduit or other metal protection for the wiring has appreciable resistance and a heavy lightning current flowing through such a metallic sheath a long way to ground may build up a potential between the conduit and the circuit as a result of the resistance drop in the conduit.

It is advisable to provide wood or masonry buildings located in lightning territory with direct stroke shielding such as lightning rods. If properly installed, this decreases the chances of trouble in the circuits, but does not eliminate them.

Metal buildings

By buildings largely of metal are meant buildings completely of metal with roof and walls electrically well connected and well grounded, or buildings with metal roofs and wood or masonry walls but with the roof well grounded. Such buildings are struck by lightning, but there is little chance of damage to the structure. It is important that the metal parts be well connected so that no high voltage or sparks develop.

Electric circuits wholly contained in such buildings are well protected against lightning overvoltages unless open wires are run close to the roof in which case secondary flashovers may occur. A spacing of two feet should be adequate.

However, if the circuits pass outside of the building, they may be struck by lightning or raised to high potential by induction from nearby strokes. These voltages will then travel into the building circuits and may cause trouble. Such circuits should be protected. What is good surge protection for these motors? Since motors are involved principally, the protection should consist of capacitors and arresters. There are usually many motors on a circuit. It is not economical or necessary to protect each motor. On 550 volt circuits with many motors, we advocate protection as shown in the accompanying illustration.

The overhead ground wires shown in the illustration will be beneficial in the case of mills highly exposed to lightning and where the circuits go outside. Often the outside circuits may be pretty well shielded already, by nearby smoke stacks or by the buildings themselves. If the circuits are highly exposed, the ground wire keeps direct strokes from them and a direct stroke on a 550 volt circuit is no joke.

The outside circuits will be well protected if run in cable with metallic sheath well grounded at intervals. This will reduce the hazard to the equipment also.

Protective equipment

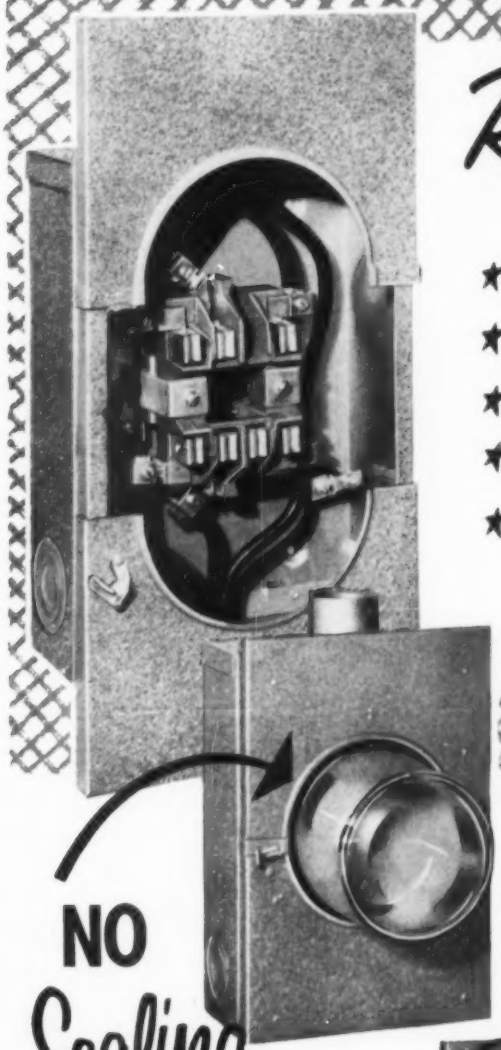
There are numerous lightning arresters available for 550 volt circuits. They are known as secondary arresters. The standard rating for these arresters is 650 volts and they are available in single or three pole constructions. The three pole units are obtainable in metal containers for indoor installation. Outdoor units are available also.

Capacitors are available for indoor or outdoor installation. Generally, three-phase capacitor unit is used, each pole of this capacitor having a capacitance of one microfarad which is more than adequate. It is about four times the capacitance that is used on higher voltage circuits, and the large capacitance for these lower voltage units compensates for the difficulties encountered in trying to get large inductances in the circuit and also makes it feasible to protect a large number of motors with only a few capacitors on the circuit.

The power to a mill, or any factory building, is frequently supplied from a transformer that is fed by a distribution system. This transformer will probably have lightning protection on the high voltage side. It should be remembered, however, that lightning protection on the transformer alone will not insure protection of the plant equipment if the mill circuits are themselves exposed to overvoltage.

A few words about grounding as applied to protective grounding, not the grounding of circuits which

(*Continued on page* 90)



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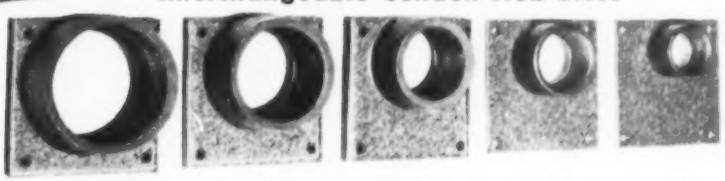

2½" 2" 1½" 1¼" 1"

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MOTOR INSTALLATION MOUNTING & CONNECTING
220 VOLT INSTALLED ON FLOOR

MOTOR SIZE	HRS. EA.	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
1	4.3	5.38	6.45	7.53	8.60	9.68	10.75	11.83	12.90	13.98	15.05	16.13
2	5.0	6.25	7.50	8.75	10.00	11.25	12.50	13.75	15.00	16.25	17.50	18.75
3	5.8	7.25	8.70	10.15	11.60	13.05	14.50	15.95	17.40	18.85	20.30	21.75
5	6.9	8.63	10.35	12.08	13.80	15.53	17.25	18.98	20.70	22.43	24.15	25.88
7 1/2	9.5	11.88	14.25	16.63	19.00	21.38	23.75	26.13	28.50	30.88	33.25	35.63
10	12.3	15.38	18.45	21.53	24.60	27.68	30.75	33.83	36.90	39.98	43.05	46.13
15	15.0	18.75	22.50	26.25	30.00	33.75	37.50	41.25	45.00	48.75	52.50	56.25
20	18.6	23.25	27.90	32.55	37.20	41.85	46.50	51.15	55.80	60.45	65.10	69.75
25	22.1	27.63	33.15	38.68	44.20	49.73	55.25	60.78	66.30	71.83	77.35	82.88
30	25.9	32.38	38.85	45.33	51.80	58.28	64.75	71.23	77.70	84.18	90.65	97.13
40	30.8	38.50	46.20	53.90	61.60	69.30	77.00	84.70	92.40	100.10	107.80	115.50
50	38.7	48.38	58.05	67.73	77.40	87.08	96.75	106.43	116.10	125.78	135.45	145.13
60	47.5	59.38	71.25	83.13	95.00	106.88	118.75	130.63	142.50	154.38	166.25	178.13
75	58.6	73.25	87.90	102.55	117.20	131.85	146.50	161.15	175.80	190.45	205.10	219.75
100	78.7	98.38	118.05	137.73	157.40	177.08	196.75	216.43	236.10	255.78	275.45	295.13

LABOR: INCLUDES MOUNTING AND CONNECTING MOTOR (NO FEEDERS, SPECIAL MOUNTING BASES OR EXTRAORDINARY JOB CONDITIONS). (ADD FOR ANCHORS).

12-55

MOTOR INSTALLATION - MOUNTING & CONNECTING
220 VOLT AT 10 FT. HT.

MOTOR SIZE	HRS. EA.	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
1	6.3	7.88	9.45	11.03	12.60	14.18	15.75	17.33	18.90	20.48	22.05	23.63
2	6.3	7.88	9.45	11.03	12.60	14.18	15.75	17.33	18.90	20.48	22.05	23.63
3	6.3	7.88	9.45	11.03	12.60	14.18	15.75	17.33	18.90	20.48	22.05	23.63
5	10.0	12.50	15.00	17.50	20.00	22.50	25.00	27.50	30.00	32.50	35.00	37.50
7 1/2	12.6	15.75	18.90	22.05	25.20	28.35	31.50	34.65	37.80	40.95	44.10	47.25
10	16.3	20.38	24.45	28.53	32.60	36.68	40.75	44.83	48.90	52.98	57.05	61.13
15	20.1	25.13	30.15	35.18	40.20	45.23	50.25	55.28	60.30	65.33	70.35	75.38
20	24.5	30.63	36.75	42.88	49.00	55.13	61.25	67.38	73.50	79.63	85.75	91.88
25	29.6	37.00	44.40	51.80	59.20	66.60	74.00	81.40	88.80	96.20	103.60	111.00
30	35.0	43.75	52.50	61.25	70.00	78.75	87.50	96.25	105.00	113.75	122.50	131.25
40	42.3	52.88	63.45	74.03	84.60	95.18	105.75	116.33	126.90	137.48	148.05	158.63
50	52.6	65.75	78.90	92.05	105.20	118.35	131.50	144.65	157.80	170.95	184.10	197.25

LABOR: INCLUDES MOUNTING AND CONNECTING. (MOTOR TAPS ONLY). (ADD FOR ANCHORS)

12-55

Electrical Estimating—III

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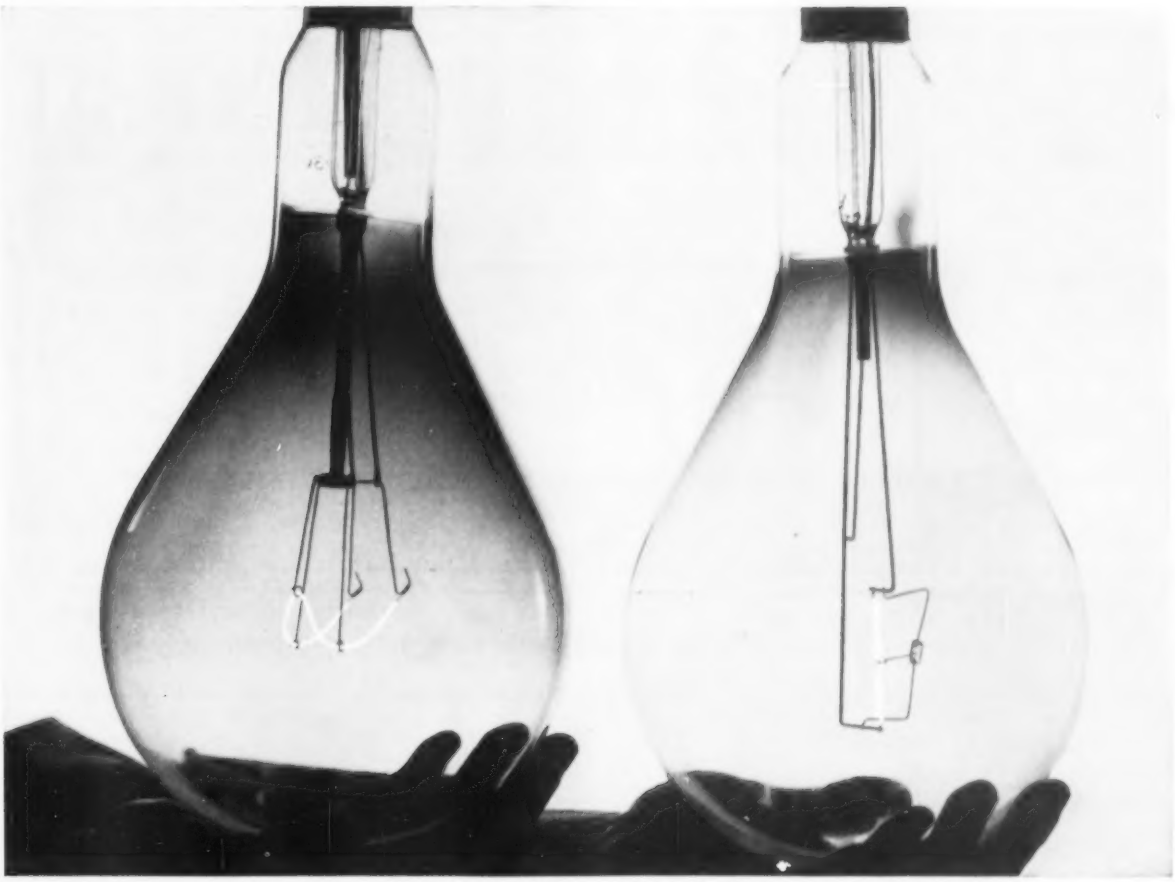
Announcing: New G-E Bonus Line of lamps, incorporating the most important development in light bulb filaments since 1913!

New G-E discovery uses revolutionary stand-up filament to give you 15% more light from a bulb



Compare standard crosswise filament, left, with new G-E stand-up filament, in bulb on right. Note reduction in bulb blackening after same hours of use.

Promises America a Yearly Light Bonus of Over $100,000,000

General Electric announces the most important development in light bulb filaments in 42 years—a filament that stands on end. It gives up to 15% more light at no increase in cost to you for current consumed.

The 750 and 1000 watt Bonus Line G-E Lamps are available now, at same list price. Other sizes from 60 to 500 watts are being redesigned to use the new stand-up filament

FOUR YEARS OF RESEARCH

Four years of intensive research were required to solve the technical problems involved in changing from the usual crosswise position to a vertical position.

The light gain achieved by the new stand-up positioning is a minimum of 6%. The new positioning makes it practical for the first time also to use a specially designed coiled-coil filament in bulbs of 300 watts and over. In these larger bulbs, the two improvements combine to bring the light increase to 15% during the life of the bulb—*extra light worth the entire purchase price of the bulb itself!*

LIGHT INCREASED, BLACKENING REDUCED

The new stand-up filament increases light output in two ways.

First, the hotter a filament burns the more light it gives, and the vertical position allows the filament to burn hotter without burning out any sooner.

Second, the effect of bulb blackening on light output is cut to a minimum. Blackening is concentrated in the stem of the bulb when it burns base up, or in a small spot at the opposite end when burned base down. Safely out of the way in either case.

$100,000,000 LIGHT BONUS

G-E incandescent bulbs using the new filament are called the G-E Bonus Line. The value of the light bonus they will ultimately deliver is estimated at over $100,000,000 a year. For more information write General Electric Large Lamp Department, Nela Park, Cleveland 12, O.

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MOTOR INSTALLATION - MOUNTING & CONNECTING
110 VOLT INSTALLED ON FLOORS

MOTOR SIZE	HRS. EA.	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
1/4	3.2	4.00	4.80	5.60	6.40	7.20	8.00	8.80	9.60	10.40	11.20	12.00
1/3	3.5	4.38	5.25	6.13	7.00	7.88	8.75	9.63	10.50	11.38	12.25	13.13
1/2	4.0	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00
3/4	4.4	5.50	6.60	7.70	8.80	9.90	11.00	12.10	13.20	14.30	15.40	16.50
1	4.9	6.13	7.35	8.58	9.80	11.03	12.25	13.48	14.70	15.93	17.15	18.38
1 1/2	5.5	6.88	8.25	9.63	11.00	12.38	13.75	15.13	16.50	17.88	19.25	20.63
2	6.3	7.88	9.45	11.03	12.60	14.18	15.75	17.33	18.90	20.48	22.05	23.63
3	7.3	9.13	10.95	12.78	14.60	16.43	18.25	20.08	21.90	23.73	25.55	27.38
5	9.1	11.38	13.65	15.93	18.20	20.48	22.75	25.03	27.30	29.58	31.85	34.13
		110 VOLT MOUNTING AT 10' HT.										
1/4	4.2	5.25	6.30	7.35	8.40	9.45	10.50	11.55	12.60	13.65	14.70	15.75
1/3	4.6	5.75	6.90	8.05	9.20	10.35	11.50	12.65	13.80	14.95	16.10	17.25
1/2	5.3	6.63	7.95	9.28	10.60	11.93	13.25	14.58	15.90	17.23	18.55	19.88
3/4	5.8	7.25	8.70	10.15	11.60	13.05	14.50	15.95	17.40	18.85	20.30	21.75
1	6.4	8.00	9.60	11.20	12.80	14.40	16.00	17.60	19.20	20.80	22.40	24.00
1 1/2	7.2	9.00	10.80	12.60	14.40	16.20	18.00	19.80	21.60	23.40	25.20	27.00
2	8.2	10.25	12.30	14.35	16.40	18.45	20.50	22.55	24.60	26.65	28.70	30.75
3	9.	12.00	14.40	16.80	19.20	21.60	24.00	26.40	28.80	31.20	33.60	36.00
5	12.	15.25	18.30	21.35	24.40	27.45	30.50	33.55	36.60	39.65	42.70	45.75

LABOR: INCLUDES LOCATING IN POSITION AND CONNECTING. (ADD FOR SPECIAL CONDITIONS, AND ANCHORS AS REQUIRED).

12-55

MOTOR PUSH BUTTON STATIONS
MOUNTED ON WOOD

NO BUTTONS	HRS. EA.	LABOR COST INSTALLED EACH AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
2	.7	.88	1.05	1.23	1.40	1.58	1.75	1.93	2.10	2.28	2.45	2.63
3	.85	1.06	1.28	1.49	1.70	1.91	2.13	2.34	2.55	2.76	2.98	3.19
4	1.1	1.38	1.65	1.93	2.20	2.48	2.75	3.03	3.30	3.58	3.85	4.13
5	1.3	1.63	1.95	2.28	2.60	2.93	3.25	3.58	3.90	4.23	4.55	4.88
		CONCRETE MOUNTING										
2	.8	1.00	1.20	1.40	1.60	1.80	2.00	2.20	2.40	2.60	2.80	3.00
3	.95	1.19	1.43	1.66	1.90	2.14	2.38	2.61	2.85	3.09	3.33	3.56
4	1.3	1.63	1.95	2.28	2.60	2.93	3.25	3.58	3.90	4.23	4.55	4.88
5	1.5	1.88	2.25	2.63	3.00	3.38	3.75	4.13	4.50	4.88	5.25	5.63

LABOR: INCLUDES INSTALLATION AND CONNECTING, MOUNTED ON WOOD.

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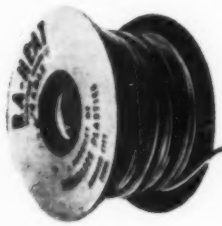
HERE'S A STAR-STUDDED CABLE



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Ra-Heat Cable is made from specially designed resistance wires insulated with a protective coating of plastic. Ra-Heat is stapled to the plasterboard and is then imbedded in plaster forming an invisible heating panel. Like the sun, Ra-Heat beams its warmth downward to objects below.

Ra-Heat Cable systems save space from the actual building of the home (you don't have to have a basement) to spacing the furniture in the rooms, this system allows four walls to place your furniture and appliances around.

Ra-Heat provides low installation costs, no upkeep. Ra-Heat is safe, no open flames or gases, no danger for children. Ra-Heat is clean, no air circulation to stir up dust. Ra-Heat is healthy, air stays moist and fresh, reduces colds. Ra-Heat is convenient, no fuel, no ashes, no breakdown.

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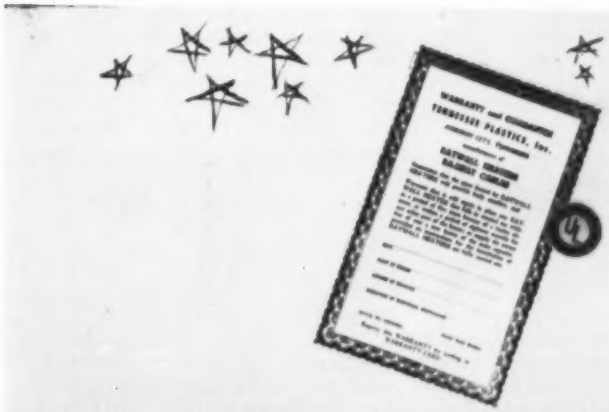

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RA-HEAT TEMPERATURE CONTROL- Degree range from 55° to 85°F. Approximately ½°F. differential. Rated at 2500W-120V or 5000W-240V, 22 amps. Just set it and forget it.

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Utility Engineers' Forum

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Atomic blast effects reported upon by EEI

◆ "EFFECTS of an Atomic Blast on Electric Power Facilities" — a detailed report by the men who carried out last spring's "Operation Cue" test — has just been published by the Edison Electric Institute.

Cleared by the Atomic Energy Commission and Federal Civil Defense Administration, the report makes these conclusions:

(1) In case of atomic attack, it appears probable that electric service could be restored to homes in a stricken area before its residents could reoccupy them. Industrial plants probably could get their service either before or as soon as the debris had been cleared and they were ready to resume production.

(2) Scope of the repair problem would depend directly on the size of the area affected. This is determined largely by the energy yield of the explosion and the meteorological influence on the radioactive cloud.

(3) Radioactivity, under the conditions of the test, would cause no particular repair problems. If an area were inhabitable, and thus require electric power, maintenance crews would be able to enter it and make repairs.

The test was made last May at the AEC's atomic test site in Nevada where Edison Electric Institute, representing the electric power industry, joined with other industries and the federal government to find out what would happen to a community under nuclear attack.

Retaining Bechtel Corporation to handle planning and specifications, EEI constructed two identical electric transmission and distribution systems. Both were placed in the so-called "Survival City" test area where houses, radio towers, industrial machinery, gas utility equipment, and other test items were located. To determine their approximate survival range, one system was built 4,700 feet from "ground zero," the point of explosion, while the other was at 10,500 feet.

Each system included a 69-kv line installed on one steel suspension tower and one steel dead-end tower; substation equipment consisting of a 69-kv oil circuit breaker, step-down transformers, and associated structures; distribution substation equipment consisting of two 4-kv oil circuit breakers and voltage regulators; and about a half-mile of 11-kv and 4-kv distribution lines construction on wood poles, with distribution transformers and secondaries.

It was not feasible to expose a large generating station to this test. Furthermore, if local generating equipment was knocked out, power could be fed quickly into stricken areas from distant points through existing interconnections between electric utilities.

Less than three hours after the blast (equivalent to 30 to 35 kilotons of TNT) EEI project members moved into the stricken area. As detailed in their report, this is what they found:

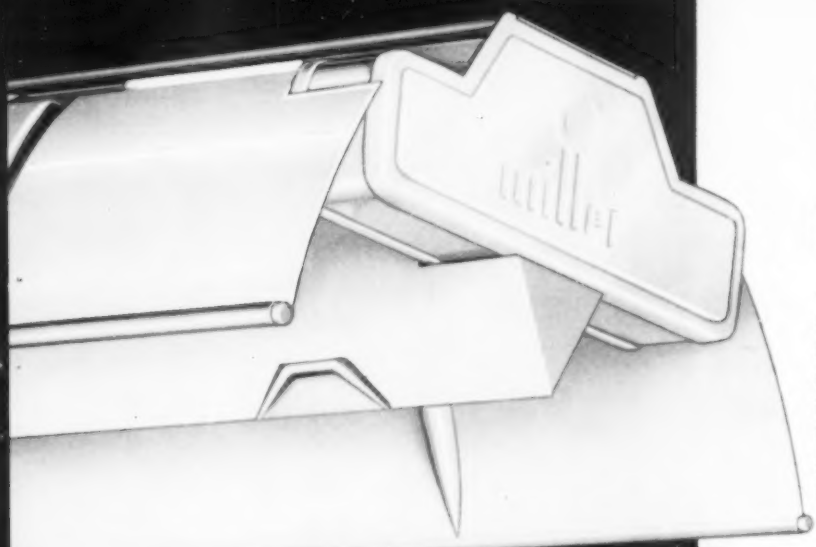
(1) The electric system at 10,500 feet was completely intact with no damage except for a dented panel door on a relay and meter cubicle. Nearby dwellings sustained damage to doors, windows and interiors.

(2) Damage to electrical installations at the 4,700-foot line was "moderate" — similar to that caused by a severe windstorm. However, the two homes of conventional construction, located in the same general area were demolished.

Blast effects rather than heat or radiation appeared to do the most damage. Hardest hit were transmission and distribution circuits but damage was of a type that could be quickly and easily repaired. One suspension-type tower had collapsed. Four of the 15 wooden distribution poles had been broken, several distribution transformers had fallen off their platforms, and secondary wires and service drops were down.

On the other hand, major substation and switching yard facilities — the most difficult and time consuming to repair — sustained only minor damage.

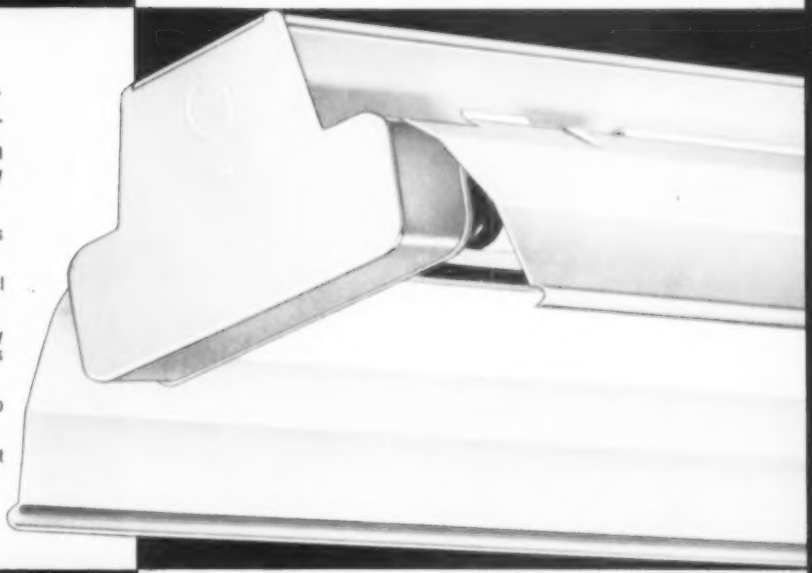
(3) Heat damage was minor: Some blistered and charred paint surfaces on transformers and regulators; poles and crossarms slightly charred but not structurally weakened; slightly burned, but still effective, insulation on aerial cable and weather-proofed secondaries. All of this was in the 4,700 foot area. (*Continued on page* 90)



NEW MILLER INDUSTRIALS MEET OR EXCEED NEW RLM SPECIFICATIONS

Charted below are 12 of the most important advances in the history of industrial lighting: the new RLM specifications for fluorescent industrial lighting fixtures. The new Miller "Industrials" meet or exceed these specifications in every instance! And that's not all! Many other "extra quality" features make this one of the finest industrial fixtures ever produced — good reason why it always pays to specify MILLER!

- 4 foot reflectors on 8 foot channels for one man maintenance—easy cleaning and changing of reflector.
- Super-rigid reflector and V-channel are stamped in one piece—with sealed rolled bead flanges and heavy reinforcing ribs, lifetime porcelain enamel.
- Extra-sized wiring channel designed for sliding clamp hangers or surface mounting.
- Miller Socket Box construction for easy, economical individual socket replacement.
- Heavy gauge pressure connector provides fast and easy assembly in continuous rows with positive electrical grounding. No screws to align.
- Extra large man-sized captive nuts for mounting reflectors to channel. No tools required.
- Special reflector aligner keeps uniform row alignment—seals light leakage between reflectors.



New RLM Specifications for:	DIRECT	SEMI-DIRECT
1. ALL-WHITE PORCELAIN ENAMEL REFLECTORS (Inside and Outside)	Yes	Yes
2. INCREASED UPWARD LIGHT	5%-15%	20%-30%
3. MAXIMUM BRIGHTNESS	Yes	Yes
4. BETTER SHIELDING ANGLES	13°-14°	27°
5. HIGHER REFLECTION FACTORS	85%	85%
6. HIGHER LIGHT OUTPUT	83%	77%
7. CAPTIVE LATCHING and HOLDING DEVICE	Yes	Yes
8. GROUNDED BALLAST MOUNTING	Yes	Yes
9. CHANNEL DESIGNED for SLIDING HANGERS	Yes	Yes
10. REVISED LAMP SPACING	5"	
11. IMPROVED LAMPHOLDERS	Yes	Yes
12. ENTIRE UNIT RUST-PROOFED	Yes	Yes

RLM STANDARDS INSTITUTE *INCORPORATED*

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4' and 8' for 48" and 96" Slimline Lamps
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Fundamentals of substation design

Part 1

by Henri A de Bonneval*

◆ THE ELECTRICAL ENGINEER has at his disposal an extensive variety of textbooks on the design of power houses, but no comprehensive publication seems to be available on the recommended practice and fundamentals of outdoor substation design. Perhaps this was caused by the apparently infinite number of combinations of designs which seem to preclude any definite approach to the problem. Nevertheless, it should be possible to establish a procedure to analyze the problem of substation design.

First, let us define a substation. The American Standard 35.40.240. defines an electric power substation as follows: "An electric power substation is an assembly of equipment for purposes other than generation or utilization, through which electric energy in bulk is passed for the purpose of switching or modifying its characteristics. Service equipment, distribution transformer installations or other minor distributions or transmission equipment are not classified as substations. Note: A substation is of such size or complexity that it incorporates one or more buses, a multiplicity of circuit breakers, and usually is either the sole receiving point of commonly more than one supply circuits, or it sectionalizes the transmission circuits passing through it, by means of circuit breakers."

With the above description of a substation, we will attempt to establish a procedure of design. Some of the salient points to consider in the preparation of the diagram and physical layout of the substation are:

1. Simplicity
2. Operating flexibility
3. Service continuity
4. Maintenance of equipment

*Mr. de Bonneval is associated with the J. G. White Engineering Corp., New York City, N. Y.

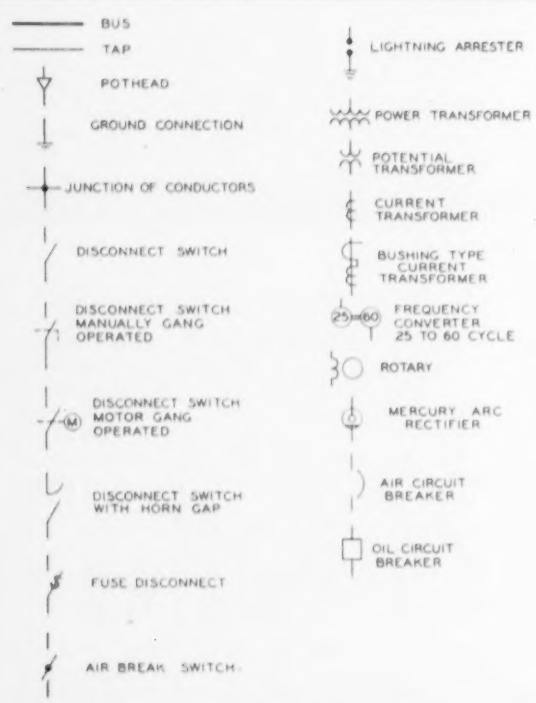

Fig. 1. Graphical symbols for electric power outdoor transmission substations.

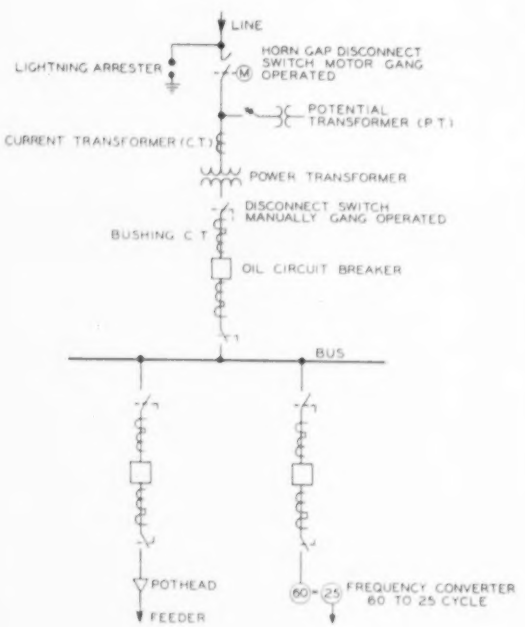

Fig. 2. One-line diagram showing typical use of the graphic symbols illustrated in Fig. 1.

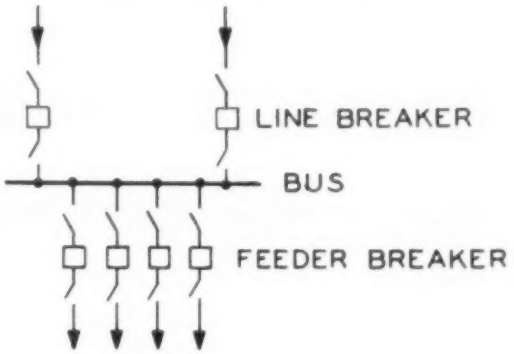

Fig. 3. Single or main-line bus.

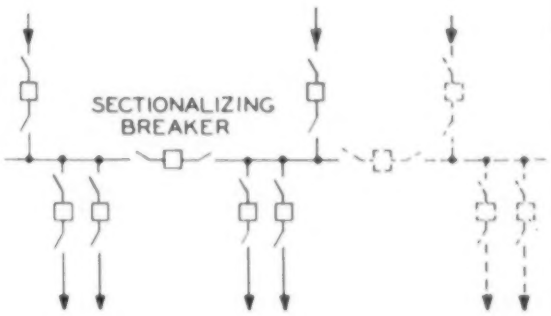

Fig. 4. Sectionalized single bus.

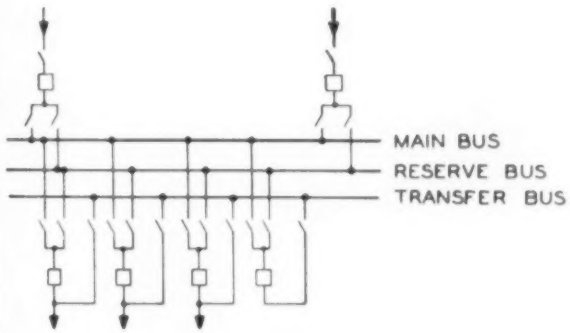

Fig. 5. Main and transfer bus.

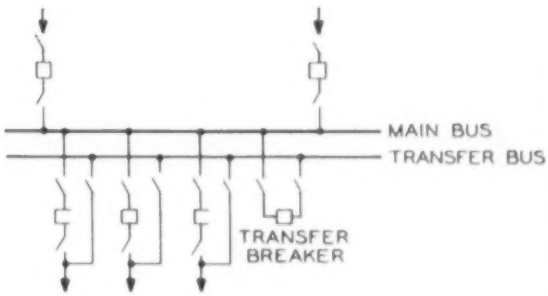

Fig. 6. Main, reserve and transfer bus.

5. Safety
6. Possibility of future extension
7. Standardization
8. Cost
9. Relay
10. Short circuit current limitation
11. Physical limitation due to space available, or location.

First, consider the single line diagram. It is the backbone of electrical design, and too much emphasis cannot be laid on the importance of a well thought out one line diagram. The National Electrical Manufacturers Association (NEMA) Power Switching Assemblies Standard SG 5-1.53 defines a one line diagram as follows: "A one line diagram is a diagram which indicates by means of single lines and simplified symbols, the route and component devices or parts of an electrical circuit or system of circuits. Physical relationships are usually disregarded."

It is good to point out that, though the Standard states that the physical relationship can be disregarded, it is nevertheless good practice to attempt so far as is possible, to orient the diagram and the component parts in the same relative and geographic position as the layout of the equipment. Figure 1 is a list of graphical symbols for electric power most commonly used for substation wiring diagrams. A typical one line diagram, Figure 2, shows the application of some of these symbols.

After the voltage has been determined, based on the availability of the supply or economic consideration, a bus arrangement is to be decided on, to assure the maximum continuity of service with facility of maintenance, in spite of possible apparatus failure. A word of caution is here interjected, the design should not be encumbered with problematic contingencies, which may greatly increase the cost and, in case of real emergency, may cause complications and mistakes in operation.

The diagrams, Figures 3 to 10, illustrate a number of accepted methods of bus arrangements.

The "single or main line bus" Figure 3, is the most elementary bus arrangement and undoubtedly the oldest and still the most widely used. It is also the most economical to build and the simplest to operate. It is considerably used in industrial plants where interruption of certain circuits can be tolerated.

As system demand continued to expand and continuity of service became more and more important, other bus schemes were developed.

The "sectionalized single bus," Figure 4, is basically the same as the "single line bus," except that the bus is divided into two or more sections by means of bus tie circuit breakers. When each section of the bus is energized by a separate feeder, zones of differential protection can be established to provide continuity of service against line failures. Feeder faults can be isolated to their own sections of the bus. Moreover, any section of the bus can be serviced while continued operation is maintained on the other section or sections of the bus.

The "main and transfer bus," Figure 5, is the most economical arrangement to provide for out-

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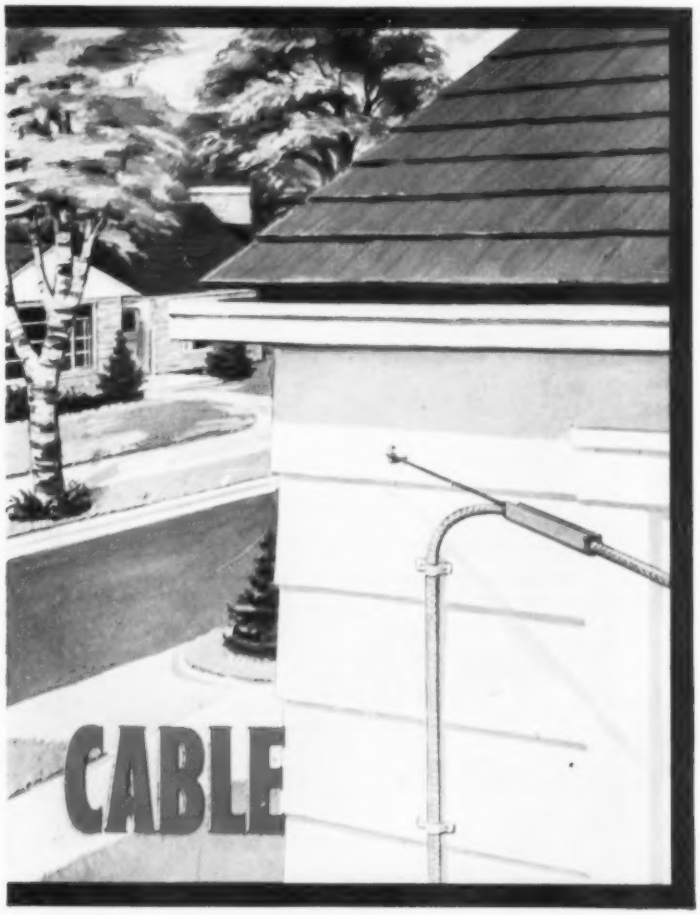

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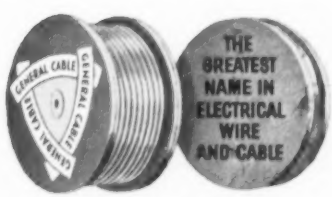

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ages and ease of maintenance. This scheme is widely used in high tension switching station and distribution where it is desirable to provide for outages without requiring switching outside of the station. It offers the facility of subdividing distribution elements into groups. The circuit may be serviced without interrupting the feeder. There is one caution to observe, and that is the disconnect switches in this scheme must be interlocked to prevent them from being used to interrupt the load.

The "main, reserve, and transfer bus" arrangement, Figure 6, provides the greatest flexibility of operation and assures continuity of service but is the most complex and costly to build. The function of the reserve bus is to act as a second main bus, to which either the line or the feeders can be connected. If loads are divided on the two buses, each with its own line transformer, one line fault will not cause a complete outage. If the line load is divided between the buses, feeder breakers of a lower interrupting capacity may be selected.

The "double bus single breaker" arrangement, Figure 7, is substantially the same as Figure 5, except that the breaker cannot be serviced without the interrupting feeder.

The "double bus, double breaker" arrangement, Figure 8, provides service on any circuit breaker without interrupting the feeder. However, this is obviously too expensive for general application.

The "breaker-and-a-half" or "H" scheme, Figure 9, can be serviced the same as the arrangement shown in Figure 8, with the economical advantage of having three breakers for two feeders instead of two breakers per feeder. This arrangement has the disadvantage of more involved relaying.

The "ring bus" arrangement, Figure 10, offers certain advantages for a limited number of feeders, probably not over six, and moderate voltages. However, in any contingency where two breakers are opened in the middle of the ring, the entire station may be out of service.

(Part 2 will appear next month)

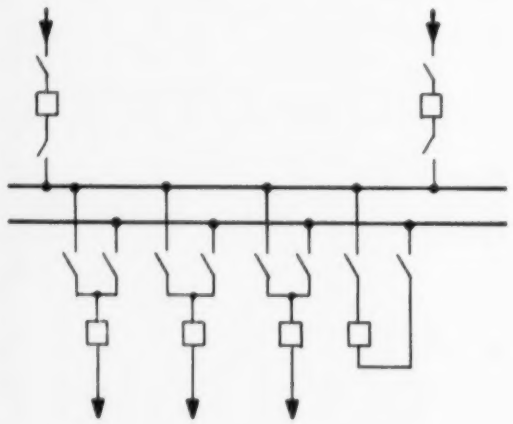

Fig. 7. Double bus, single breaker.

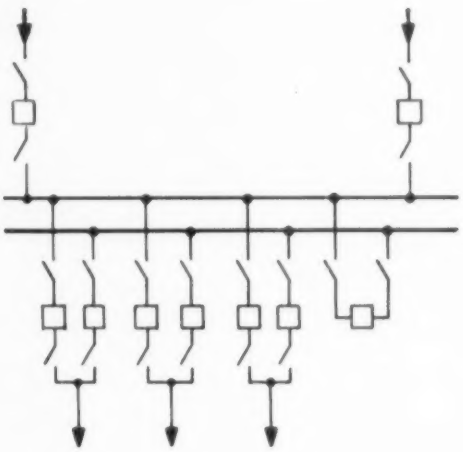

Fig. 8. Double bus, double breaker.

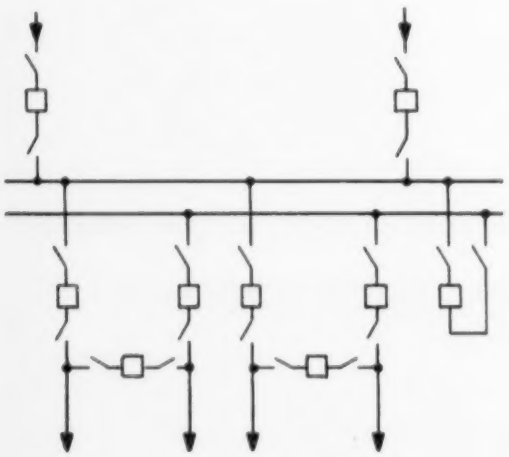

Fig. 9. Breaker-and-a-half scheme.

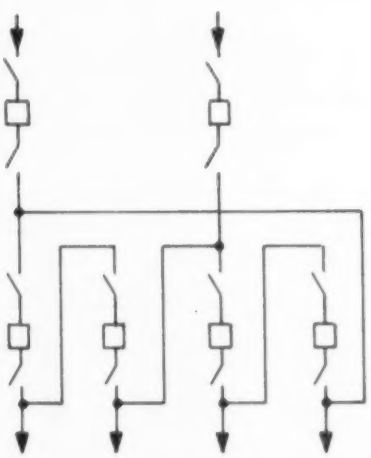

Fig. 10. Ring bus.

Substation maintenance and test practices

by G. G. Mattison, Asst. Supt., and
R. F. Dorton, Maintenance Engineer

Electrical Construction and Maintenance Dept.
Duke Power Co., Charlotte, N. C.

◆ THIS ARTICLE describes the practices of the Duke Power Company in maintaining and testing substations and substation equipment. It is not presumed that the practices set forth represent the ultimate in a comprehensive maintenance and testing program; however, they have proved to be of inestimable value in our own particular program.

Substations

For many years on the Duke system all substation construction and maintenance work was performed by one of a number of general crews. By general we mean that any crew could erect a complete steel substation, mix and pour concrete for foundations, check and install transformers, assemble, check and install oil circuit breakers, air-break switches, fences, and all other components of the substation. However, the rapid development of new equipment with more complicated parts and strict adjustment requirements created a need for specialization among our crews.

The shift to specialization was of necessity a gradual one; however, at the present time all of our crews are divided into more or less specialized lines of work such as, transformers, oil circuit breakers, steel erection, rigging and hauling, capacitors, switchboard wiring and control. Although this paper is primarily concerned with maintenance practices, we mention that the Maintenance Department is also a Construction Department, and we do all of the substation maintenance and electrical construction work required on the Duke system with these same crews.

It might be of interest to mention, at this point, that our department is also responsible for the installation and maintenance of all electrical equipment in generating plants.

Each individual substation is visited at least once a month by the Division Supervisor or his assistant, at which time a visual inspection is made of the station and the equipment. Division men make most of the minor repairs such as, loosened connections, leaking oil gauges, etc. Any item found needing major repairs or repairs requiring the service of skilled crews are reported to the Maintenance Department General Office where corrective measures are initiated.

Air-break switches

All air-break switches are manually trip-tested once each month for satisfactory operation. If the air-break switch fails to trip on the first test it is so noted on the report to the General Office and the reason is given for failure. Repairs are handled as described above.

Batteries and battery chargers

Voltage and specific gravity checks are made on storage batteries daily at attended stations and weekly at unattended stations. Once each month "equalizing charges" are made by raising the voltage 10% and holding for 24 hours after which the floating charge is resumed. The batteries are visually inspected at the time of tests and wiped clean and dry. The water level is brought up to normal if necessary. A Storage Battery Monthly Report for each battery installation is forwarded to the Maintenance Department where they are closely studied and any variation in cell voltage is investigated. In addition, our special battery crew visits each location twice a year at which time additional voltage and gravity checks are made, deteriorated cells replaced, battery charges reset to proper value, charger tubes checked or replaced, and other repairs made as necessary. If there is an unusual condition noted the station operator may be requested to keep a close check on the condition — notifying the battery foreman if the condition becomes worse.

Dry type "Hot Shot" batteries, which are used for tripping air-break switches and in some cases to close such switches by the use of special wound gear-head motors, are checked monthly by reading amperes between terminals with a small direct reading ammeter. All batteries testing below our standard of 25 amperes are replaced with a new battery and all "Hot Shot" batteries are replaced yearly.

Watt-hour meters

All watt-hour meters are visually inspected hourly at attended stations and at least monthly at unattended stations. Once every three months each watt-hour meter is thoroughly inspected and tested. Voltage and current are checked for balance, KW and KVA loads are measured and the accuracy of the watt-hour meter and demand meter register is checked at full load and at light load by means of a rotating standard, which in turn is checked at least every two weeks against a master rotating standard meter in the company laboratory. Once each year a complete over-all test of each metering equipment installation is made at which time the ratios of the current and potential transformers are checked, and the watt-hour meter is tested against a three-phase standard meter.

Station grounds

At all substation locations the resistance of the station ground is tested at least once each year by use of a low resistance Ground Megger. This ground consists of

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This article is adapted from an address presented recently before the Engineering and Operation Section, of the Southeastern Electric Exchange.

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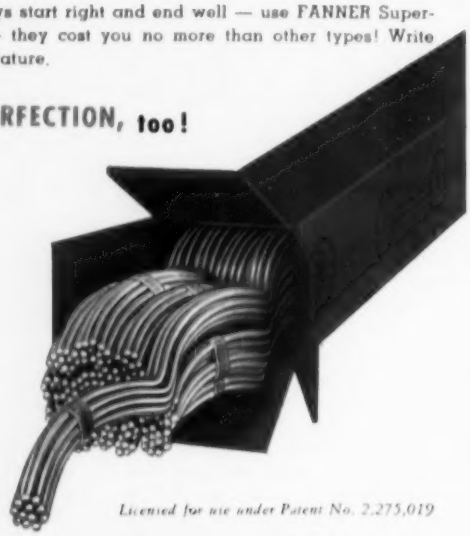

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a multiplicity of driven rods, well spaced from each other, and tied together with 2/0 copper wire to form a grid. Where the resistance measured is considered excessive attempts are made to bring the resistance down to a satisfactory level.

Cables

All control cables at the stations having storage batteries for control source are tested once each year. These tests are made by impressing 600 volts d.c. on the subject cable and reading the milliamp leakage to ground of the close and trip circuits, positive and negative wires, signal light and alarm circuits. In addition, at the time cable tests are made, the resistance in ohms of trip circuit is taken at the control board with an ohmmeter, this includes the auxiliary switch in series with trip coil in oil circuit breaker mechanisms. A resistance is placed in series with the trip coil for determining the minimum operating current and voltage required. This value is checked against previous records and if there is any appreciable change an investigation is made to determine the cause, and then restore the breaker mechanism to proper working condition.

Relays

In general, protective relays on the Duke system are grouped under (1) primary transmission and distribution circuits, and (2) secondary circuits and step-down stations. Circuits under group one are equipped with high-speed fault-clearing devices. Protection on the second group consists of inverse time-delay over-current relays with liberal use of instantaneous trip attachments.

To assure that protective equipment is in proper working condition, all circuit breakers are operated from their protective relays once each month, and an over-all test and calibration of relays with associated equipment is made once each year.

Substation equipment

The external visual inspection of substation equipment made monthly by the Division Supervisor, or his assistant, comprises only a small, but valuable, portion of our maintenance program. Various types of equipment require different methods of maintenance with some overlap of practices. We shall describe our maintenance

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Money-saving advantages now available on higher rated units

TYPE BKM for 1200 and 1500-ampere use has opening for primary conductor 4¼" high, 1¾" wide.

TYPE BKM for 2000 and 4000-ampere application has 4¼" square opening for primary conductor.

New Additions to Allis-Chalmers service-proved line of molded current transformers are designed for heavy duty metering. Liberal design provides plenty of overcurrent capacity, with no overheating or reduction of accuracy.

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- **Easy Conversion** to 5000-volt bar-type units will be made with a handy conversion kit, as on previously announced smaller units in the line.

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practices according to the equipment category.

A complete record of each transformer, except pole-type, on the Duke system is maintained in the Maintenance Department General Office. These records consist of pertinent information such as, number, size in KVA, location, tap setting, temperature rating, service record, etc. Once each month the Division Supervisor sends to the General Office a report showing maximum top oil temperatures and maximum hot spot temperatures, if indicator is provided, of all transformers in his division. These temperatures (maximum indicated since the previous reading) are recorded and reviewed. If these temperatures are above what we consider to be a satisfactory limit, the load is checked from office records and either fans are installed on the bank or, if necessary, arrangements made to replace the bank with one of sufficient size to carry the load with resultant lower temperatures.

Transformers

After assembly, all new transformers, and all transformers being moved from one location to another, are thoroughly checked and tested before placing in service. By means of the Transformer Turn Ratio Test Set (TTR), manufactured by James G. Biddle Co., each transformer is ratioed throughout all tap ranges. In addition, oil tests and insulation tests are made on each unit and are described later.

Most of the repair work on transformers is performed by our regular transformer crews. This work ranges from repairing leads, filtering oil, replacing bushings, regasketing bushings or tank covers, to installing new, partial or complete, high and low voltage windings, and complete core and coil units. The minor repair work is done at the location site and the major repair work is done at one of several strategically located repair centers.

After new windings or partial windings are installed, the transformer is dried until insulation tests are satisfactory. Transformers are usually dried by the short circuit method in the field except in those cases where new windings are installed by a local shop of the representative manufacturer. In these cases the winding is dried in their oven until it tests satisfactory and is then tanked. Usually no further drying is necessary.

Oil circuit breakers

Records similar to those on transformers are maintained in the General Office on oil circuit breakers showing location, circuit, manufacturer, voltage and ampere rating, interrupting capacity, service record, etc. Records are made of the number of tripouts on each breaker and reviewed monthly. From the tripout record we have been able to set up a preventive maintenance schedule based on the number of tripouts, type of breaker, fault duty imposed, etc. In general, oil circuit breakers are overhauled at intervals ranging from 10 to 40 tripouts depending on the aforementioned conditions. In addition, all oil circuit breakers are inspected and overhauled at maximum intervals of 3 years whether they have had tripouts or not. All generator breakers are overhauled once each year as well as after each fault operation. We feel that it is wise to use a time schedule in conjunction with an operations schedule for overhauling because the condition of a breaker may deteriorate over a period of time without any fault operations.

New oil circuit breakers and oil circuit breakers moved from one location to another are tested and serviced before being placed in service.

Overhauling or servicing oil circuit breakers is complete and thorough. The oil is removed through a filter press and the tank and parts are wiped clean with lint-free rags and inspected.

The inspector will, while observing the mechanism and breaker parts, see that all pins and bushings subject to wear are lubricated, all cotter pins are in place and spread at the ends, and all nuts, bolts and screws are in place and tight. Any evidence of heating is noted and bushings are checked for cracks or flashover points. The manufacturer's instruction book is followed closely in checking all adjustments to both breaker and mechanism.

The contacts are checked to see that all are aligned properly and the contact surfaces bear with firm uniform pressure. Contact compression, stop clearances, clearance between contact rods and bottom of chamber contacts, stroke, clearance for all moving parts, and opening spring and buffer adjustment are checked. The contact resistance is measured with a ducter or low reading resistance bridge before and after overhauling and at the time of the regular Doble test. Any significant change in resistance since the previous reading calls for an immediate investigation of the contacts and associated parts to ascertain the reason for the variation.

The dash pot pistons are examined for freedom of movement. The dash pot oil level is checked and replenished with new oil where necessary.

The control wiring is inspected for loose or worn insulation and for evidence of bad connections or heating.

Because of the complexity and importance of operating mechanisms we have a special crew whose primary function is to inspect and adjust them. This is in addition to our regular oil circuit breaker crews.

Opening, reclosing and normal operating cycle speeds are measured, where oil circuit breaker mechanical features permit, by the use of the Cincinnati Analyzer manufactured by the Cincinnati Clock and Instrument Company. Adjustments in operating cycle speeds are made as necessary.

Motors and compressors of all pneumatic oil circuit breakers are checked daily. Heaters in the mechanism are inspected weekly. Air storage tanks in the mechanism are equipped with drain valves which are opened weekly to drain moisture and monthly to test low (air) pressure alarm.

Capacitors

All capacitor installations are visually inspected weekly by the Division Supervisor or his assistant. At regular intervals dust is blown out and units wiped down depending upon their location. If exposed to lint, dust, coal, or other foreign matter they are cleaned weekly; otherwise, monthly.

Records of the number of operations on each capacitor breaker or interrupter disconnect switches are maintained in the General Office. Through experience, we have set up an overhaul schedule for the capacitor breakers or interrupter disconnect switches based on the number of operations they have had. In general, oil circuit breakers are overhauled after 200 to 600 operations, depending mainly on the type of oil circuit breaker in the unit. Air-break switches in capacitor units are overhauled after 800 operations. Interrupter disconnecting switches are inspected and interrupter parts replaced if necessary after 75 operations for

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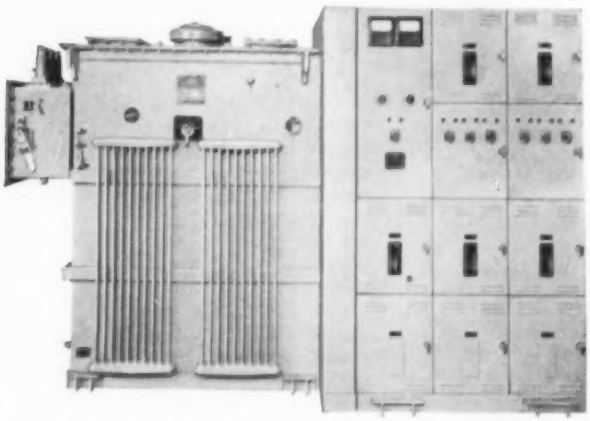

500 Kva, 13,800 volt Askarel-cooled SORGEL transformer, with primary liquid filled switch, secondary meters, and circuit breakers.

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SORGEL transformers are not just ordinary transformers. They are especially designed and constructed to be installed indoors, close to load centers, thereby obtaining the most efficient distribution and better voltage regulation.

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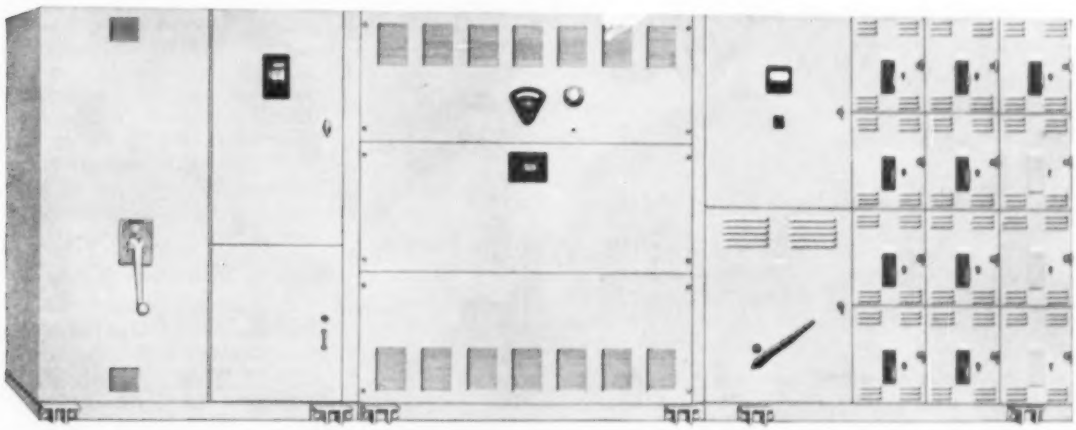

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600 volt capacitor units and after 150 operations for 2400 volt capacitor units.

At three-month intervals all capacitors are thoroughly inspected and checked by our special capacitor crew.

Miscellaneous equipment

(1) *Supervisory Control Equipment* — All supervisory control equipment at the dispatching end is operated several times daily using the "check-back" feature to insure that all positions are as indicated.

At three-month intervals all supervisory control equipment is tested and inspected by our special crew. All tubes are tested and replaced if necessary. Relay contacts are checked for correct operation and are cleaned with a fine contact file.

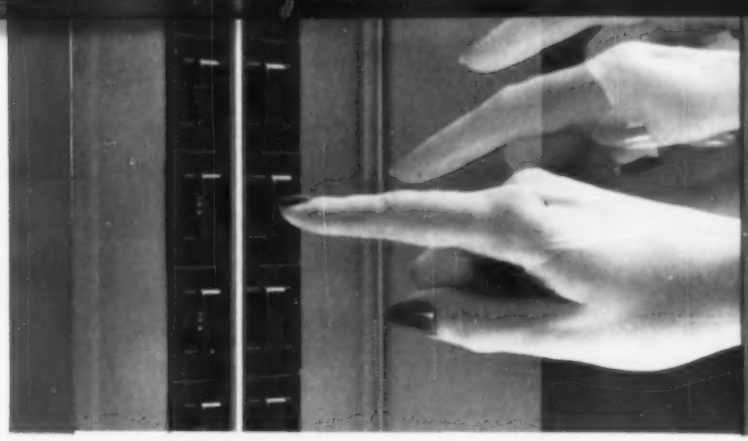
(2) *Painting* — All outdoor equipment such as, transformers, oil circuit breakers, regulators, capacitor housings, etc., are painted as necessary. Usually, the painting crews paint all the equipment in one division area then move on to the next area. By this procedure all the equipment on the system is repainted at intervals of five to to seven years.

(3) *Lightning Arresters* — All station type lightning arresters are tested before being placed in service, and annually thereafter. We utilize the Doble test set for these tests. The loss in watts is measured at a test voltage nearest the arrester rating up to 12 KV; on arresters above that rating we are limited to 12 KV due to the voltmeter range. By the simple E^2/W formula the resistance in ohms is obtained, and by comparison with other similar units the defective units can usually be recognized. This test has proven to be of tremendous value to us over the past few years in detecting defective arresters.

Insulation testing

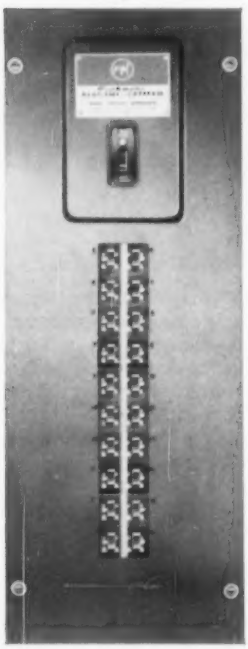
One of the major problems of maintenance is that of insulation deterioration with subsequent possible failure. The Duke Power Company has been cognizant of insulation failure problems for many years. However, prior to the early 1930's the maintenance program consisted mainly of visual inspections along with oil dielectric tests.

One test method begun in the early 1930's and still in use today is the use of the "Hi-Pot" insulation tester. This device is similar



Duo-Guard Pushmatics® in BullDog Electri-Centers protect branch circuits *and* appliance cords . . . safely, automatically. And they're convenient. Just a "push" restores service. No fuse boxes . . . no fuses to change. No danger of electric shock, either.

The new terminal screw retainer in each Duo-Guard provides bolted connections . . . makes installation fast, easy. No lost screws. No special tools.



NOW! FROM BULLDOG

one main disconnect, full 100-amp service

IN ONE COMPACT PUSHMATIC PANEL!

BullDog's new 100-amp service panel combines full 100-amp service with the convenience and protection of one main service disconnect—all in a single Pushmatic Electri-Center®.

A special I-T-E breaker in the upper section of the panel serves as the main disconnect . . . eliminates the need for a safety switch. Installation is easier, faster, *safer*. And homes are more modern—more fully protected.

Famous Duo-Guard Pushmatics in the lower section automatically protect and control all branch lighting circuits and all 110-220 volt appliance circuits. Pushmatics mean pushbutton convenience, too—an end to the bothersome fuse box and fuse fumbling.

Specify and install this advanced, new BullDog service panel. Available with 14 or 20 circuits, it can be located anywhere in the home or office . . . assures adequate wiring capacity for all present and future needs. Listed by UL. Check your qualified BullDog distributor or field engineer. Or, write BullDog Electric Products Company, Detroit 32, Michigan. © BEPCO

IF IT'S NEW
. . . IF IT'S DIFFERENT
. . . IF IT'S BETTER . . . IT'S

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ELECTRIC PRODUCTS COMPANY
A Division of I-T-E Circuit Breaker Company

Export Division: 13 East 40th Street, New York 16, New York. *In Canada:* BullDog Electric Products Company (Canada), Ltd., 80 Clayson Road, Toronto 15, Ontario.

CONSULT THE FOLLOWING SOUTHERN REPRESENTATIVES:

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WILSON ELECTRICAL EQUIPMENT CO.
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STANDARD ELECTRIC MFG. CO.
2401 Federal St., P.O. Box 1138
Dallas 1, Texas

WALKER ELECTRICAL CO., INC.
70 Bennett St., N.W., P.O. Box 8, Sta. D
Atlanta, Georgia

to the Roller Smith "Hot-Stick" and is used to test bushings in transformers or oil circuit breakers, in particular, at those locations where it is difficult to obtain a service interruption to make a test. This insulation tester measures the potential gradient over the bushing from line to ground under actual line potential and may be used on circuits from 13 KV thru 132 KV. The test set consists of a high resistance (320 megohms) bakelite—insulated test stick, an indicating instrument, a ground prod and the necessary connecting cable. Readings are taken with the tip of the test stick placed directly on the hot line bushing terminal, adjusting the indicating instrument to 100%, then placing the test stick tip successively under each rainshed of the bushing and plotting the potential gradient over the bushing in terms of 100% line to ground voltage. From comparison of the resulting curve with characteristic curves of the same type bushing being tested, the approximate extent and location of internal defects can be determined, thus making possible the removal of many defective bushings before an actual failure occurs.

In view of the fact that the "Hi-Pot" tester is effective only for bushings, in 1938 the Duke Power Company began using the Doble test equipment for extensive insulation testing of all types of electrical apparatus including bushings, transformers, oil circuit breakers, insulators and lightning arresters. When using the Doble test set, however, the equipment being tested must be disconnected from service.

This test has the advantage over "Hi-Pot" testing in that it is adaptable for testing all types of insulation and that usually single readings will suffice to determine the insulation condition.

The test procedure varies in accordance with the type of electrical insulation being tested. In general, however, the apparatus under test is charged at the desired test voltage and readings are noted on the ammeter and wattmeter. The humidity and temperature of the air are also taken. By calculation from the observed test readings, the Power Factor of the insulation is obtained. The Power Factor of an insulation is the cosine of the angle between the charging current vector and the impressed voltage vector. In other words, it is a measure of the energy component of the charging current. The basic principle of the Doble test procedure, then, is that deterioration of insulation results in an increase in Power Factor value.

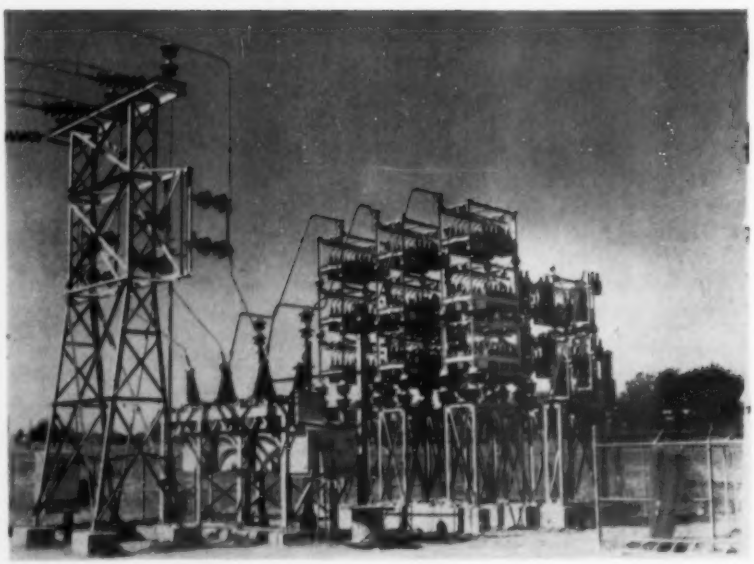
All power transformers and their bushings on the Duke system are tested by Doble test at least once each year except at retail and industrial stations where the service cannot be interrupted. The

Oklahoma capacitor station controlled by VDS system

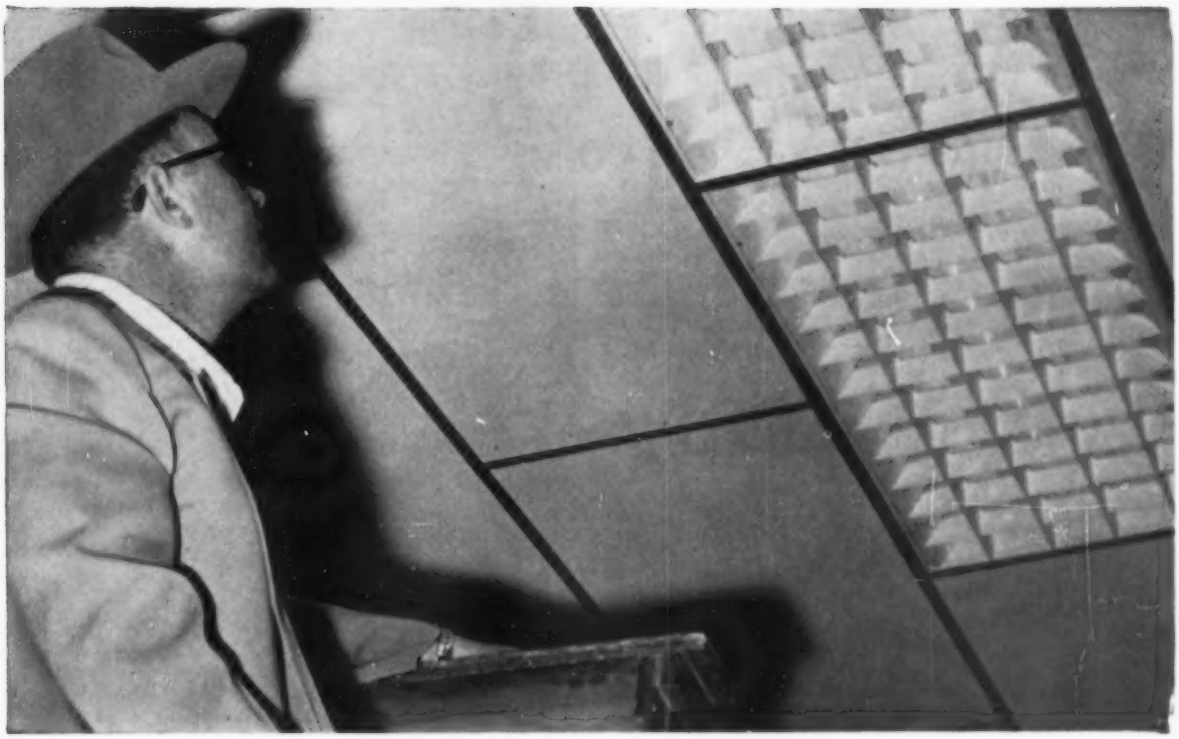
◆ INSTALLATION of a 5250-kvar capacitor bank that utilizes the Voltage Divider Switching (VDS) method was completed recently by Public Service Company of Oklahoma. Erected in Hugo, Oklahoma, the bank has an operating voltage of 66.5 kv and consists of two steps, five series groups per step. The first step of 3000 kvar is switched by an oil circuit breaker, whereas the second step of 2250 kvar is switched by 15-kv NR oil switches — one on each series group.

According to the principle of the VDS method, the first step acts as a voltage divider. Voltage levels are established for each series group, and the potential gradient increases with each successive group. Parallel groups in the first and second steps are at the same gradient. Because the NR switches operate individually and at slightly different instants, the incremental change in capacitance minimizes system disturbance. In addition, use of the VDS method is said to provide economies in initial equipment cost and subsequent maintenance.

This bank is protected by the auxiliary neutral scheme. One capacitor unit per series group, unfused and insulated from the main bank, provides a floating-neutral reference for relaying in the event of bank unbalance. This scheme does not respond to a system disturbance.



This 5,250-kvar capacitor bank installed recently at Hugo, Oklahoma, by Public Service Company of Oklahoma, utilizes the voltage divider switching method. This method is reported to minimize system disturbance as a result of switching the capacitors on and off the system.



John Pickett of John C. Pickett Electric Co., Lubbock, Texas, on the job with Day-Brite Mobilex®

"We like to install Day-Brite Mobilex"

John Pickett is another contractor who's "sold" on Day-Brite, because Day-Brite helps him do a clean, fast job. Read what he says:

"From long experience we know that Day-Brite 'hits the mark' by building quality and dependability into their product. After all, that's what sells a job—and keeps it sold. The Mobilex line is typical:

"Mobilex requires less man-hours for installation. This saves time; lets us work more efficiently.

"Mobilex is a truly flexible fixture. Lighting units and ceiling elements are interchangeable at any time.

"Our customers like the high efficiency, low-brightness comfort they get with Mobilex.

"Naturally, this helps us build satisfied customers—backs up our reputation for dependable work.

"This is why we like to install Day-Brite Mobilex. We intend to keep on doing it."

SEE, EXAMINE and COMPARE! Look at the fixtures, not just the pictures. Call your Day-Brite distributor.

5474

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at any of the products carrying the Arro Trademark and you will find that the quality of the material and workmanship is "tops" . . . so solve your drilling and anchoring problems by specifying Arro.

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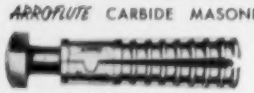
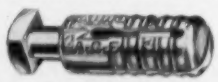
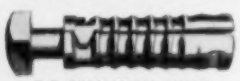


LAG SCREW EXPANSION SHIELD



A-C-E EXPANSION SHIELD

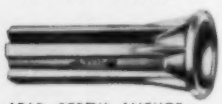
DOUBLE EXPANSION SHIELD



O-E EXPANSION SHIELD

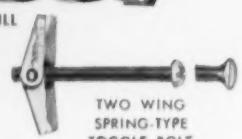
MACHINE SCREW ANCHOR

STUD BOLT ANCHOR



LEAD SCREW ANCHOR

MAL-LEAD BOLT ANCHOR



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retail and industrial station transformer bushings are tested by "Hi-Pot" tester once each year. The majority of the oil circuit breakers on the Duke system are tested by Doble test once each year and at larger or strategic stations twice each year. The exceptions are those smaller stations where service cannot be interrupted, and in these instances, the bushings in the oil circuit breakers are tested by the "Hi-Pot" tester. Potential, metering, and current transformers at the larger stations are tested at least once every two years by Doble test.

All new transformers, oil circuit breakers, potential transformers, and miscellaneous equipment are tested by Doble test before being placed in service. In addition, all euipment moved from one location to another on the system is Doble tested after transit and before placing in service.

When tests have been made on equipment the results of the tests are incorporated on the proper data sheet, and a grading is assigned to the insulation as to whether it is in a "good," "deteriorated" or "bad" condition. The data sheets are forwarded to the General Office where each individual item of equipment is studied carefully. From the results of these tests proper measures are taken to prevent insulation failure.

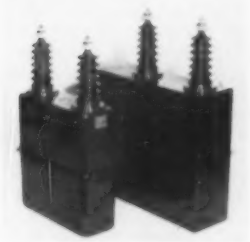
Oil tests

In addition to the testing of insulation heretofore described, we conduct a large number and variety of tests on oil. Each time a transformer or oil circuit breaker is "Hi-Pot" tested, overhauled, or inspected by one of our crews a dielectric test is made on the oil. Also, at the time of the Doble test, a power factor test of the oil is made. This insures that oil tests of all the electrical equipment on the Duke system are obtained at least once per year. If there is anything unusual about the oil test such as, burnt odor, dark coloring, etc., one or two 1-quart samples are brought to the testing laboratory for further analysis. At the testing laboratory the oil is checked for acidity, power factor and interfacial tension (dynes per CM). From these tests, such preventive maintenance as filtering oil to remove carbon or water, the reclaiming of old oil, which involves the removal of acid and other contaminants, the installa-

(*Continued on page* 88)

Notes on new utility equipment

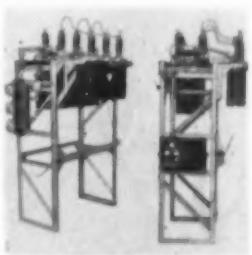
Development of a 50-kilovar power capacitor, reported to be the first production unit of this rating, has been announced by the General Electric Company's Capacitor Dept., Hudson Falls, N. Y. The new rating is double that of the standard 25-kvar capacitor. Constant improvement of the capacitor components: aluminum foil, dielectric paper, and Pyranol insulating and cooling fluid, have made the larger unit feasible, according to G-E. The unit is designed to provide larger and more compact capacitor equipments to cope with the increasing reactive loads on utility systems. With the new units, capacitor banks of greater kilovar capacity can be installed in spaces now filled by banks of 25-kvar units, the company reports, with lower installation costs per kilovar. The 50-kvar unit is single-phase, 60-cycle, with voltage ratings from 2,400 to 7,960. It has an all-welded steel case and hermetically sealed bushings and weighs about twice as much as the G-E 25-kvar unit.



The new Circle Seal P-391 transformer breather valve, manufactured by Circle Seal Precision Valves, Pasadena 8, Calif., is designed to meet requirements of American Standards Association C57.12a for control of temperature induced pressure changes in oil filled power transformers. The unit, made of solid brass bar stock, is rugged in both construction and design and can be mounted externally without additional protection. A standard gage connection is used and no additional piping is required. Essentially two relief valves in a unit package. The valve also incorporates a manually operated sampling valve with a hose barb connection. Screened inlet and outlet are provided.

Stainless steel cover bands, mercury limit switches with enclosed contacts, and a cushion-mounted control cabinet are new features of single-phase induction regulators recently announced by G-E's Power Transformer Dept., Pittsfield, Mass. The new covers are easily removable and provide evenly distributed pressure around the nitrile rubber gasket. The new switches stop the operating motor at the maximum raise and maximum lower positions, while the enclosed contacts prevent fouling by foreign material. The possibility of vibration being transmitted to the control cabinet by metal-to-metal contact is eliminated and more accurate regulation is assured by the cushion mounting.

Current metering devices, offered as an accessory by Line Material Co., are used with the Kyle Type R recloser and TR transformer. Load growth can be observed with the new devices to provide accurate information for system planning. Correct planning avoids overloading transformers; and where single-phase loads are served, possible serious unbalanced conditions can be checked, before they cause trouble. Two types of current metering devices are available. One a conventional meter, indicates an instantaneous value of current in each phase, and the other, a thermal ampere-demand meter, indicates demand by responding to temperature changes caused by the changing values of current. The thermal meter indicates average load and maximum current for each phase. The instantaneous indicating current meters are housed in a weatherproof steel cabinet and can be mounted either on the recloser frame or other nearby structures. The meter trough of the thermal device is a standard, rain-tight unit arranged for mounting three meters in a vertical manner. The device can be mounted either on the Type R recloser substation frame or near-by structures.



A new self-protecting series capacitor for connection to the neutral windings of distribution transformers has been announced by the General Electric Company's Capacitor Dept., Hudson Falls, N. Y. The unit is designed specifically for series applications and eliminates the need for external protective devices, G-E engineers report. The new capacitor is available for use with distribution transformers rated 10-kva, 2,400-volts and above.

News of the industry

edited for Southern readers

Annual "Electrical Week" celebration dates set

THE WEEK of February 6, 1956, has been selected as National Electrical Week by representatives of the electrical industry. This is Thomas A. Edison's birthday week.

Following a proposal made by the International Association of Electrical Inspectors to celebrate National Electrical Week annually, representatives of the industry unanimously adopted the following resolution:

"**Resolved,** that the undersigned duly appointed representatives of the organizations with which their names are associated do hereby constitute themselves as a committee to establish and encourage the appropriate recognition of National Electrical Week during the week of February 6, 1956 and annually thereafter during the week in which the 11th of February falls, that being the birthday of Thomas Alva Edison, from whose inventive genius came so many contributions to the electrical industry, and

"Be it further resolved, that the purpose of National Electrical Week shall be to focus attention on the contributions of electricity to our American Way of Life and on the contributions toward the economic strength of our country of the organizations which make up the electrical industry, and

"Be it further resolved, that the importance of Safety through adequacy of wiring installations, as included by the International Association of Electrical Inspectors in their original proposal for National Electrical Week adopted at their national convention held in Chicago in September over-all objectives stated above, and

"Be it further resolved that all elements of the electrical industry be encouraged to cooperate in accomplishing the foregoing objectives."

M. E. Skinner of St. Louis, vice-president of Union Electric Co. of Missouri, St. Louis, Mo., was elected chairman of the National Electrical Week Committee. Col. S. R. Todd, Chicago, president of the International Association of Electrical Inspectors, was elected vice-chairman. J. T. Coatesworth, commercial director, Edison Electric Institute, New York City, was elected secretary.

Present at the meeting were representatives of the following national electrical associations: Air Conditioning and Refrigeration Institute, Edison Electric Institute, International Association of Electrical Inspectors, International Association of Electrical Leagues, National Appliance and Radio-TV Dealers Association, National Association of Electrical Distributors, National Electrical Contractors Association, and the National Electrical Manufacturers Association.

New simplified rules feature EEI awards

ELECTRIC LIGHT and power companies will welcome the new simplified terms governing 1955 entries for the twenty-nine awards in the Awards Contests presented annually through Edison Electric Institute. They are, briefly: inclusion of a one-page synopsis with each entry; all material to be covered in five sections listed; entry size not to exceed 15 inches by 18 inches; elaborate art work and covers are prohibited.

These new conditions make it a simple matter to compile entries for several contests. They are specifically listed in the 1955 Awards folder available from EEI. If needed, additional copies will gladly be sent upon request to EEI.

Another important point is that size of company is not a factor in winning awards. What really counts is the success of the job done in relation to the area served. Several of the contests offer duplicate prizes to companies in various meter classifications.

Of special interest are the new 1955 Lighting Awards. Lighting Promotion Awards will now cover *promotional* efforts. Better Light-Better Sight Awards — new this year — will cover *educational* efforts.

Companies with exceptional results in sales promotions this year are urged to start preparing entries now. Because of the new 1955 rules, it won't take any more effort to assemble several entries this year than it formerly took for a single entry.

Moe Light opens Hopkinsville plant

MOE LIGHT DIVISION of Thomas Industries, Inc., Louisville, announces the opening of a new plant at Hopkinsville, Ky.

The new plant contains 115,000 square feet of manufacturing and warehousing space, on a plot of 22 acres. The plant is designed for easy expansion. Among its outstanding features is a mechanized conveyor belt system of order picking which speeds all items of an order through the checkers and

This new plant of the Moe Light Division of Thomas Industries, Inc., Louisville, Ky., was formally dedicated at Hopkinsville, Ky., recently, in ceremonies which included plant tours and an open house for area residents and guests invited from around the nation. The plant, which will produce residential lighting fixtures, contains 115,000 square feet of manufacturing and warehouse space. Moe Light has three other plants, including one at Princeton, Ky.

Why freeze your dollars in communications equipment?

When the Bell System furnishes your communications, you profit from many important advantages.

1—Your money is not "frozen" in equipment, but is free to produce income.

2—You pay only a monthly charge for services tailored to your exact needs.

3—You avoid a large capital investment.

When you use Bell System communications, you eliminate all problems concerning maintenance and obsolescence. Also, you get the benefit of trained personnel, expert servicing and continuing analysis.

If you haven't taken a good look at your communications lately, why not let a Bell System communications engineer survey your needs without cost or obligation. Call your Bell Telephone representative.

BELL TELEPHONE SYSTEM

TELEPHONE TELETYPEWRITER MOBILE RADIO TELEMETERING AND REMOTE CONTROL CHANNELS

onto one of the fleet of trucks maintained by Thomas Industries for delivery to customers East of the Rockies.

Moe Light, one of the world's largest manufacturers of residential lighting fixtures, also operates plants at Fort Atkinson, Wis.; Princeton, Ky.; and Los Angeles, Calif. Another modern plant and showroom will replace the present Los Angeles facility in the near future. It also will house the Moe Light subsidiary, Star Light, which manufactures fixtures primarily for West Coast distribution.

Thomas Industries also includes the Electric Sprayit Division, manufacturer of portable paint spraying equipment and air compressors, and the Wright Power Saw Division, maker of power saws featuring a revolutionary reciprocating blade principle. Both divisions are in Sheboygan, Wis.

The new Moe Light plant in Hopkinsville will be under the direction of Kim Moe, vice-president in charge of branch plants, and Howard Stone, plant manager. Production is already in force, and more than 200 employees are presently employed, with more to be added as equipment installations are completed.

Tampa Electric sponsors Electrical Exposition

FLORIDA'S tenth Annual Electrical Exposition to be held Jan. 31 through Feb. 11, 1956, in connection with the Florida State Fair at Tampa has been announced by Tampa Electric Co.

More than 100 products of the nation's leading electrical manufacturers will be on display in the spacious, modern, attractively decorated Florida Electrical Exposition Building that is now a landmark of the Florida State Fair.

Century Electric opens Birmingham branch office

ANNOUNCEMENT of the opening of a new district office at 831 N. 19th St., Birmingham, Ala., has been made by the Century Electric Co., St. Louis, Mo. Nick Cardella, formerly of Century's Atlanta branch, is in charge of the new branch, which will serve as a stocking point for Century Electric Motors.

The opening of a new District Office in Jacksonville, Fla., has also been announced by Century. The new office will be under the direction of Burton E. Tebo, formerly of Century's branch office in Atlanta. Serving as a stock point for Century Electric Motors, the new District Office will serve all of the State of Florida except the city of Pensacola and territory east of the Appalachicola River.

Century's Atlanta Office will continue under the direction of R. E. Lynch.

Century Electric manufactures a complete line of motors, single phase and polyphase, alternating current and direct current, from 1/20 to 400 horsepower. Company headquarters are in St. Louis, with 33 branch offices and warehouses located in major cities throughout the United States.

TOMIC SALES AGENT—Ewing Dale, right, district sales manager for Tomic Sales Engineering Co., shows details of the line to William F. Bishop, of Avondale Estates, Ga. (near Atlanta). Mr. Bishop was recently appointed manufacturer's agent for the Tomic line in Georgia and Alabama.

Utility engineer shortage predicted

THE EXPECTED increase in the use of electricity in the years immediately ahead threatens to create an acute manpower shortage in the ranks of public utility engineers, Harllee Branch, Jr., president of the Edison Electric Institute, declared recently at a round-table conference of public utility industrial relations men in Chicago.

Mr. Branch, who is also president of the Georgia Power Co., predicted that America's installed generating capacity in 1965 will be 215,000,000 kilowatts, or double today's figure. Electricity sales are expected to be 850,000,000,000 kilowatthours, or more than twice the total for last year. These figures are expected to double again by 1975.

The speaker declared that "the great advancements in the arts of generation and transmission of electricity are the result of continuing research work by the electric industry and by the manufacturers of equipment. As we stand now at the beginning of the atomic age, it is obvious that our research activities will have to be multiplied many times over."

He pointed out that "if the technical problems are to be met and overcome, the young engineers we are hiring today are the ones who will have to solve them 20 or 30 years from now."

Mr. Branch called attention to the "alarming fact" that the number of first-class engineering students interested in going into the utility business is declining, while the industry itself is expanding. "Utility companies are suffering because there just aren't enough engineering graduates to meet the needs of business and industry as well as the professions." Mr. Branch said the challenge and romance of the utility industry have never been presented adequately to young engineering graduates. This is the fault of management rather than any shortcoming in the business itself, he said. He suggested that executives of the electric industry should more actively support the colleges and universities, as a means of increasing the supply of trained manpower and also of interesting college students in public utility careers.

Mr. Branch noted the growth of automation in American business and referred to it as the "technical revolution of the second half of the 20th century just as mass production was of the first half." He said, contrary to some opinions, automation will not result in over-

all displacement of employees but will have a profound impact on the qualifications and functions of employees. He declared, "It has been the general experience that mass production upgrades former unskilled laborers into semi-skilled machine operators, and automation will upgrade the semi-skilled machine operators into highly skilled and educated technicians—multiplying their incomes in the process. Automation must be made to result in the human use of human beings; that is, in the greater use of man's specific human qualities—his ability to think, to analyze, to decide."

Mr. Branch pointed out that the electric industry has an investment per employee which is one of the highest, if not the highest, of any industry in the country. The investment per employee was $55,500 in 1950. Today it is more than $76,000.

"The question I would like to ask," he said, "is whether our employees are as good as our machines? Are they increasing in value the way our machines are increasing in cost and efficiency? This is the problem posed by automation: finding and training employees so that they will be as good as the machines they operate."

Stocking representative appointed by Frigid

THE APPOINTMENT of the S. C. Stockdale Co., 1032 Boulevard, NE, Atlanta, Ga., as representative for the complete Frigid line of ventilating equipment in the states of Georgia, Florida, Alabama, and Eastern Tennessee, has been announced by George J. Turin, sales manager of Frigid, Inc., Brooklyn, N. Y.

The Stockdale company has handled ventilating equipment as manufacturers' agents for the past 20 years, serving the wholesalers in the Southeast, and will warehouse stocks on the complete line of Frigid fans in its Atlanta warehouse.

Potter succeeds Spurr as Monongahela president

RETIREMENT of A. C. Spurr from the presidency of Monongahela Power Company and the election of Don B. Potter to succeed him were announced recently.

Mr. Spurr, a 30-year veteran of Monongahela and its affiliates in the West Penn Electric System, completed his services on October 31. Mr. Potter, for the past year the company's administrative vice-president, took over as president on November 1.

The changes in top management of the electric utility serving central and northern West Virginia and areas of three adjoining states were made public following the regular October meeting of the Monongahela board of directors.

The Spurr retirement removes from the utility field a man who, as president of Monongahela since 1935, has made an outstanding record and has gained national recognition for progressive management practices.

Mr. Potter, 26 years with the company, brings to the president's chair broad experience in all phases of operations. Born in Pottersdale, Pa., a town named for the family, Potter attended West Virginia Wesleyan College, at Buckhannon for two years, then entered Carnegie Institute of Technology

D. B. Potter

where he majored in mining engineering, while acquiring fame as a football player at a time when Tech was a national gridiron power. He followed a career as mining engineer from 1923 to 1929, when he joined Monongahela as an industrial engineer.

He developed sales experience as commercial manager, and in 1941 he became operations super-

A. C. Spurr

visor in Clarksburg and a year later advanced to Clarksburg division manager.

Mr. Potter came back to Fairmont in 1948 to head up the company's New Business Department and in 1950 he became assistant to executive vice-president, C. H. Leatham, now retired. In 1952 he was elected vice-president in charge of power generation, and in the fall of 1954 advanced to the office of administrative vice-president. Through the past 12 months he has been closely associated with President Spurr, handling much of the detail of the president's office.

Potter has been active in electric industry affairs regionally and nationally. Recently, he was elect-

Left to right, S. C. Stockdale, Les Stockdale, and Carl Hogan, examine a Frigid window fan. The S. C. Stockdale Co. has been appointed manufacturer's representative for the Frigid line.

ed president of the Public Utilities Association of the Virginias, being elevated from first vice-president. He has served on the Industrial Sales Committee of Edison Electric Institute, and is a member of the management group of the Electric Companies Advertising Program, which represents the industry in national publications and network television.

Industrial electronics department established

THE FORMATION of a new department in Baltimore for the manufacture of a line of industrial electronics products has been announced by Westinghouse Electric Corporation.

Robert C. Cheek, formerly assistant manager of the company's Baltimore electronics division, has been named manager of the industrial electronics department. The department will be part of the industrial heating division which has its headquarters in Meadville, Pa.

The plant facilities in Baltimore will be located at Eagle and Smallwood Streets. The department, which will employ about 115 persons, will be responsible for the engineering, manufacture and sale of induction heating equipment, power line carrier equipment, and a variety of other industrial electronic devices.

A native of Charleston, S. C., Mr. Cheek joined the Westinghouse student training course in 1939 following his graduation from Georgia Institute of Technology. From 1942 until 1951, he was a consultant on power systems problems and subsequently acted as a specialist in carrier and microwave applications all over the country. In 1951, Mr. Cheek was transferred to Baltimore as assistant sales manager for the electronics division. He was appointed assistant division engineering manager in 1953.

Dates Ahead

National Rural Electric Cooperative Association, St. Louis, Mo., Jan. 23-26, 1956.

Plant Maintenance and Engineering Show, Convention Hall, Philadelphia, Pa., Jan. 23-26, 1956.

American Institute of Electrical Engineers, Winter General Meeting, Hotel Statler, New York, N. Y., Jan. 30-Feb. 3, 1956.

Southeastern Electrical Wholesalers Association, Sixth Annual Industry Day Meeting, Atlanta Biltmore Hotel, Atlanta, Ga., Feb. 2-3, 1956. M. L. Tice, exec. vice-president, P. O. Box 176, Ben Hill, Ga.

Utility Buyers Group, Annual Convention, Edgewater Beach Hotel, Chicago, Feb. 4-8, 1956.

12th Annual National Adequate Wiring Conference, LaSalle Hotel, Chicago, Ill., Feb. 23-24, 1956.

Mississippi Chapter, IAEI, Annual Meeting, Edwards Hotel, Jackson, Miss., Feb. 20-21, 1956.

Southern Safety Conference and Exposition, Biltmore Hotel, Atlanta, Ga., March 4-6, 1956. W. L. Groth, exec. Dir., P. O. Box 8927, Richmond 25, Va.

National Electrical Manufacturer Association, Edgewater Beach Hotel, Chicago, Ill., March 12-16, 1956.

Oklahoma Utilities Association, Annual Convention, Oklahoma City, Okla., March 22-23, 1956.

American Institute of Electrical Engineers, Southwest District Meeting, Dallas, Texas, April 2-4, 1956.

Illuminating Engineering Society, Southern Regional Conference, Birmingham, Ala., April 5-7, 1956.

Illuminating Engineering Society, Southwestern Regional Conference, Hilton Hotel, Ft. Worth, Texas, April 8-10, 1956.

National Industrial Service Association, Inc., Bellevue Stratford Hotel, Philadelphia, Pa., May 13-17, 1956.

National Association of Electrical Distributors, 48th Annual Convention, Ambassador-Chelsea Hotels, Atlantic City, N. J., June 10-16, 1956.

Virginia Chapter, IAEI, Annual Meeting, Hotel Roanoke, Roanoke, Va., June 25-26, 1956.

American Institute of Electrical Engineers, Summer and Pacific General Meeting, San Francisco, Calif., June 25-29, 1956.

American Institute of Electrical Engineers, Fall General Meeting, Morrison Hotel, Chicago, Ill., Oct. 1-5, 1956.

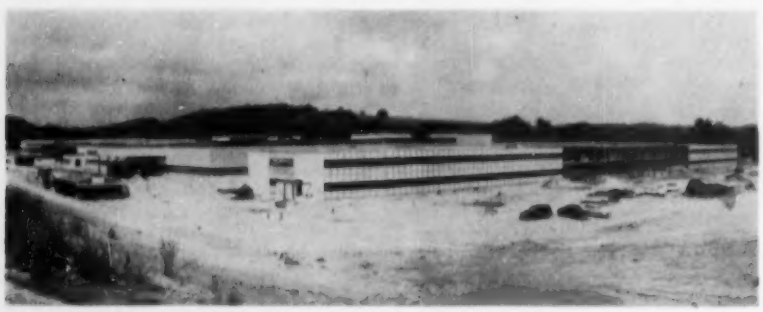
G-E control plant nears completion at Roanoke

PILOT OPERATIONS will start this fall at General Electric's new multi-million dollar plant near Roanoke, Va. The plant of more than 600,000 square feet will house manufacturing and office facilities for the company's Industry Control Department which currently is headquartered in Schenectady, N. Y.

B. W. Mahoney, department general manager, said transfer of operations from Schenectady will take place gradually. The new plant is expected to be completed about January, 1956, and the transfer should be completed early in 1957, according to G-E.

It is estimated the plant will employ some 1,800 persons upon completion of the move from Schenectady. Located about three miles beyond Roanoke on the outskirts of Salem, Va., the new facilities include the main plant and a separate building which will house an engineering laboratory. Total site is 96 acres. Construction began in the summer of 1954.

Mr. Mahoney said the new plant



General Electric's new multi-million dollar plant for its Industry Control Department nears completion at Roanoke, Va. Operations will be transferred to the new facilities from Schenectady, N. Y.

This could be you—"In the Land of No Distributors."

Imagine the chaos that would result if there were no distributors!

Conceivably, most of your day would be spent interviewing and sampling the wares of a constant stream of manufacturers' salesmen. How much easier—and more time saving to rely on your distributor salesman to keep you abreast of the thousands of different products he handles.

In addition, "in the land of no distributors"—

- **you would have to place orders all over the country and wait for erratic deliveries**
- **you would be forced to carry a tremendous inventory (and insure it)**
- **your "over-the-counter" purchases would be major headaches**
- **your order department and accounts payable department would have to be increased a hundredfold**

That's why dependable electrical manufacturers advise you to always buy from—

YOUR DISTRIBUTOR — THE BEST FRIEND YOUR BUSINESS CAN HAVE! He's the *one* source for *everything* electrical—and he's local.

TRIANGLE CONDUIT & CABLE CO., INC.

NEW BRUNSWICK, NEW JERSEY

Manufacturers of Arteries for Electricity, Liquids and Gases

WIRE • CABLE • CONDUIT • BRASS and COPPER TUBE • PLASTIC PIPE

HOLOPHANE ASSEMBLY—E. C. Gatewood, Charlotte, N. C.; Judd Lough, Atlanta, Ga.; E. M. Smith, New Orleans, La.; C. A. Patterson, Houston, Tex.; W. G. Campbell, Dallas, Tex., and F. E. Lott, Miami, Fla., District Engineers for Holophane Company, Inc., New York, attended a five day sales conference at the Holophane Engineering Center in Newark, Ohio. Included in the program of sales and engineering subjects was an inspection trip through the factory, a feature of which was the newly completed assembly building, a section of which is illustrated above.

and location will provide for excellent transportation facilities, nearness to a growing industrial market, and opportunity for future plant expansion.

The department manufactures large control devices and equipment for industry.

NACE meeting to stress corrosion loss reduction

MEANS OF REDUCING the nation's multibillion dollar annual loss to corrosion will be stressed at the 12th Annual Corrosion Conference of the National Association of Corrosion Engineers. The meeting will be held March 12-16, 1956, at Hotel Statler, New York City. Persons from all parts of the world have been invited to participate in discussions and information exchanges on many aspects of corrosion control.

"The need for corrosion prevention is ever increasing and the exchange of fundamental data and practical experiences becomes more necessary," said Frank L. Whitney, Jr., president of NACE, when he announced that the conference for the first time will encourage world-wide participation. A variety of discussions devoted to corrosion principles, chemical inhibitors, corrosion problems in the petroleum industry, oil and gas production, chemical industry, steel metallurgy, power and communications, pipeline problems, corrosion by high purity water, cathodic protection, high temperature corrosion, plastics, protective coatings and instrumentation will be featured. In addition, three educational lectures will be given on: Mechanism of Corrosion Inhibitor Action; Relationship of Thin Films to Corrosion and Techniques of Thin Film Study; and Effects of Velocity on Corrosion.

Meetings of more than 67 NACE technical committees will be held also during the week of the conference.

Chairman Reed, of G-E pays tribute to South

ONE OF THE NATION'S leading industrialists said in Atlanta recently that America has a low standard of living—compared to what it can have, and probably will have within the next ten to twenty years.

Philip D. Reed, chairman of the board of the General Electric Co., said that while it has become fashionable in the past ten years to speak of "our high standard of living," it's time for business leaders to take a "new, daring look at the whole process of creating new products, developing new markets and getting the goods built, sold and delivered.

"We think we have an efficient economic system," Mr. Reed continued, "but I am convinced that we are only beginning to understand the true potentials of scientific management in a free industrial society."

Mr. Reed, in Atlanta for one of a series of conferences with General Electric officials in key Southeastern cities, paid special tribute to Georgia and the South for their highly successful efforts in expanding industrial production and creating new enterprises throughout the area.

General Electric is one of the

"I don't give a hoot—you birds use the ladder just the same!"

South's most active new industrial citizens, Mr. Reed pointed out. The company during the past ten years has invested about $250-million in 19 new plants in 10 Southern states. One of these is the $25-million medium power transformer plant now in operation in Rome, Ga. The company also employs some 700 persons in Atlanta in sales and service work.

The G-E Board Chairman said the electrical industry, which is growing twice as fast as the economy as a whole and is expected to

Philip D. Reed

double its production in the next ten years, is the key to raising our standard of living to new heights.

Mr. Reed said that his own company's faith in the future of America is evidenced by the fact that the company is spending more money on expansion this year than in any previous year in its history. The $165-million General Electric is spending on expansion in 1955 will bring to $1-billion, 200-million the total G-E investment in new plants and equipment since 1946.

Florida distributor named by Tork Clock

AMONG the new distributors appointed recently by Tork Clock Co., Inc., Mt. Vernon, N. Y., is Union Supply Co., Inc., 1210 S. Monroe St., Tallahassee, Fla.

The Union Supply Co. will carry a complete and ample stock of Tork time switches for automatic on-off control of lighting, air conditioning, heating, and other electrical equipment, reports Dorset J. White, sales manager of Tork.

Novelty Lighting names Southern representatives

NEW SALES representatives in the Southeast for Novelty Lighting Corp., Cleveland, Ohio, have been

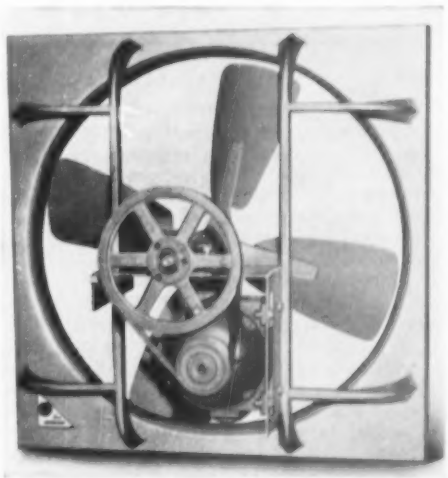
NEED TO VENTILATE AN OFFICE — OR COOL A COLISEUM?

1,439,000 cfm breeze by "Buffalo" Package Propeller Fans ventilates this mammoth new Heart O' Texas Coliseum at Waco, Texas. *Mechanical Contractor: Nuckols-Cathey and Co., Inc., Waco, Texas.*

BIG installation savings! Supplied as "Packages", complete with motor and V-belt drives. Part of 60 Belt-Air Fans in Coliseum.

"BUFFALO" BRINGS PROPELLER FAN ECONOMY TO BIG JOBS!

With this greatly expanded and improved line of "Buffalo" package Propeller Fans, many ventilation jobs once considered too costly or impractical are now being done to satisfaction. First cost and installation savings are significant. Performance, of course, is the big test — amply proved by the fact that the gigantic air moving job at the Coliseum above is done on a total of only *66 horsepower!* "Buffalo" Package Propeller Fans in sizes from 8" to 144" are ready to give you equal satisfaction. Write today for BULLETIN FM-1234 on your company letterhead, and see the wide range of applications. NOTE: no one *type* of fan is the "answer" to *all* problems. "Buffalo" builds all types — centrifugal, axial flow and propeller fans — each with the "Buffalo" "Q" Factor* of bonus performance built into it. Bulletins on request.



HUSKY — EFFICIENT! Note sturdy die-stamped construction of this Design 53 Belt-Air Package Fan. Thirty-six 54" and twenty-four 42" Belt-Airs move 1,439,000 cubic feet of air per minute in the Heart O' Texas Coliseum — on 66 h.p.

**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*

"Buffalo"

BUFFALO FORGE COMPANY

210 Mortimer St. Buffalo, New York

PUBLISHERS OF "FAN ENGINEERING" HANDBOOK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Sales Representatives in all Principal Cities

INDUSTRIAL EXHAUSTERS BELTED VENT SETS PROPELLER FANS "E" BLOWERS-EXHAUSTERS

announced by Maurice W. Terkel, treasurer.

Representing the Novelty Lighting Corp., in Alabama, Georgia, and Florida, is Robert Kuzell, 183 Midway Rd., Decatur, Ga.

In the State of Tennessee, Novelty Lighting Corp. will be represented by Collin Finney, 4048 Outer Drive, Nashville, Tenn.

The Novelty Lighting Corporation has specialized since 1905 in the design and manufacture of interior and exterior incandescent lighting equipment for churches, schools, hospitals, institutions, and public buildings, as well as homes.

Douty & Downie expands agency sales staff

DOUTY & DOWNIE, representing Pass & Seymour and several leading electrical manufacturers, announce the addition to their organization of Carroll Buress. With the exception of three years in military service, Mr. Buress has been actively engaged in sales with a Baltimore wholesaler since 1948, and, in his new connection, will cover Maryland and the District of Columbia.

The Virginia territory is covered by Harris Turner, with a branch office in Richmond, Virginia.

The main office of the Douty & Downie agency is at 2323 Maryland Avenue, Baltimore. The principals are Paul F. Douty and Calder C. Downie.

Carroll Buress

Southland Supply, Dallas to distribute Asco line

THE APPOINTMENT of Southland Supply Co., Inc., 2034 Amelia St., Dallas, Tex., as authorized stocking distributors of Asco solenoid valves, has been announced by the Automatic Switch Co., of Orange, N. J.

Glidden Engineering and Equipment Co., 6115 Denton Drive, Dallas, is the authorized manufacturer's representative for Automatic Switch in the Dallas area.

News about people

William R. Heath, vice-president-manufacturing, of **Buffalo Forge Co.,** was elected executive vice-president of the company, at a recent meeting of directors.

Mr. Heath was graduated from Cornell in mechanical engineering in 1922. Entering the engineering department of the company the same year, he became assistant chief engineer in 1924. In 1948 he was made chief engineer; in 1951, director of manufacturing; a director in 1952, and vice-president in 1953.

George P. Schivley, plant manager of Buffalo Forge Co., was appointed director of manufacturing.

Mr. Schivley, a graduate of Drexel Institute, came with the company in 1940 as works engineer, having previously had extensive manufacturing experience. He became superintendent in 1942, plant manager in 1951.

Alfred M. Rosenblatt, executive vice-president, has announced the appointment of **G. C. Goldspinner** as advertising manager for **Globe Lighting Products, Inc.**

Previous to joining the Globe organization in 1954 as assistant to the marketing manager, Mr. Goldspinner served as assistant advertising manager for House of Swansdown, Inc. The present appointment is in conjunction with Globe's expanding advertising activity.

Wayne D. Baker has been appointed manager of the South Central sales district of the **Westinghouse Lamp Division,** it was announced in New Orleans recently by **R. A. Corvey,** Southeastern regional manager. In his new position, Mr. Baker will make his headquarters in New Orleans, and will be responsible for Westinghouse lamp sales in Louisiana, Southern Mississippi, the Southwestern corner of Alabama, and Western Florida.

A native of Centre, Ala., Mr. Baker joined the Westinghouse Lamp Division at Atlanta in 1947 and has served as a sales representative in Florida, New Orleans, and Greenville, S. C. His most recent assignment was as assistant to the regional manager in Atlanta, from which he comes to his new position.

Fred B. Woods has been appointed assistant to the regional sales manager and regional specialist for the southeastern states for the **A. B. Chance Co.,** it was announced by **Jack Curtright,** sales manager of electrical wholesaler products for

F. B. Woods

that company. Mr. Woods will assist Regional Manager **W. A. Moss** with administrative duties and supervise all regional representatives in product presentations.

He has been in the sales department of A. B. Chance for the past seven years, most recently as district sales manager in Richmond, Va. He will now headquarter in the A. B. Chance Southeastern regional office in Atlanta.

Roy P. Gay, president of **Gay Electric Co.,** Dallas, Texas, was elected president of the Northeast Texas chapter of the National Electrical Contractors Association at the group's recent meeting.

He was also recently elected president of Dallas' Downtown Exchange Club. Mr. Gay is a member of the club's board of directors.

Appointment of **William G. Lewis** and **Frank T. Gifford** as manager of sales, circuit breakers, and chief engineer, circuit breakers, respectively, has been announced by **J. F. Chipman,** general manager of **Allis-Chalmers** Boston Works.

Mr. Lewis had been assistant manager of sales at Boston Works. Prior to that he had served successively as assistant engineer-in-charge of circuit breaker sales and assistant to the general manager. He joined the company in 1926.

Mr. Gifford had been assistant chief engineer of the switchgear department. He came to Allis-Chalmers in 1937 and was an assistant division engineer for the company's large outdoor circuit breaker line

S·E·W·A·

SOUTHEASTERN
ELECTRICAL
WHOLESALERS
ASSOCIATION

INDUSTRY DAY ISSUE

JANUARY, 1956

In 1956 ELECTRICAL SOUTH will again work with the SEWA for closer industry cooperation.

Electrical South sets the stage for the important Industry Day Meeting of the Southeastern Electrical Wholesalers Association to be held February 2 - 3, 1956, Biltmore Hotel, Atlanta, Georgia.

Attracting representatives from all branches of the electrical industry, the meetings provide a forum for the discussion of intra - industry problems, ethics, and mutual interests.

The January issue presents a wonderful opportunity for you to reach deep into the fast-growing Southern electrical market. The SEWA Industry Day issue will carry your advertising far and wide among wholesalers, contractors, utilities and REA Co-ops, throughout the South and Southwest.

You can take full advantage of this situation by scheduling space to give you man-sized coverage of the strategic electrical market "down South."

Write, Wire or Phone your Space Reservations NOW! Forms close December 17th, 1955.

ELECTRICAL SOUTH

until January, 1946 when he was appointed division engineer. In 1954 he was named engineer in charge of circuit breaker design.

Wagner Electric Corp., St. Louis, Mo., recently announced the appointment of **Paul C. Ford** as chief engineer of its Electrical Division to succeed **C. P. (Charlie) Potter** who is retiring after more than 46 years with the Wagner organization.

In 1937, Mr. Ford, then a recent graduate of Purdue University with a B.S. in electrical engineering, joined Wagner as a student engineer.

P. C. Ford

In 1953 he was made assistant manager of Wagner's Transformer Engineering Division, serving in that capacity until appointed to his present position.

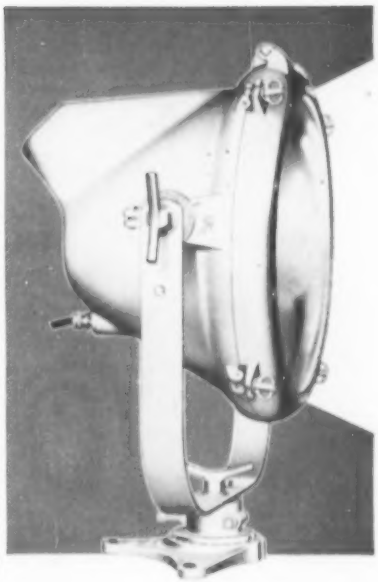
Mr. Potter joined the company as a student engineer, following his graduation from the University of Illinois in June, 1909. Through succeeding years he served in a number of key engineering positions and for the past nine years has been chief engineer of the Electrical Division.

Two new vice-presidents were elected to **Lightolier, Inc.**, manufacturers of lamps and lighting fixtures, at a meeting of the board of directors recently.

Herbert M. Schatz will direct the firm's Architectural Contract Lighting Division which, under his supervision has, in a few short years, become a substantial contributor to the company's annual volume.

William F. Blitzer, as head of product development, will direct the work of the firm's engineering, research and designing staffs. This department plays an important part in the firm's recent entry into the fields of commercial, institutional, landscape, and hospital lighting.

Appointment of **D. W. Webb** as manager of sales, switchgear assemblies and unit substations, and of **Albert Ewy** as chief engineer of



FOR LONG-RANGE ECONOMY... SPECIFY...

PYLE-NATIONAL

ENCLOSED FLOODLIGHTS

WEATHER-TIGHT . . . DIRT-TIGHT

For permanent, outdoor lighting installations, Pyle-National floodlights are the most economical in the long run.

Rugged, corrosion-proof materials and tight gasket sealing against dirt and moisture keep maintenance and replacement costs exceptionally low. Pyle-National floodlights will retain their original high efficiency output indefinitely. Many installations are still in excellent operating condition after 25 years of service!

Write for catalog 2100, which gives a complete description of our extensive line of heavy duty floodlights. Sizes: 10"-12"-14"-16"-20"-23"

SINCE 1897

Sold Nationally Through Authorized Distributors.

THE PYLE-NATIONAL COMPANY

1354 North Kostner Avenue · Chicago 51, Illinois

District Offices and Representatives in Principal Cities of the U. S. and Canada

PLUGS AND RECEPTACLES · PYLET CONDUIT FITTINGS

switch-gear assemblies, has been announced by **John V. McGuire**, manager of the switchgear department at **Allis-Chalmers Manufacturing Co.**

Mr. Webb, who had been engineer-in-charge of sales of switchgear assemblies and unit substations since 1952, joined Allis-Chalmers in 1948.

Ewy had been engineer-in-charge of switchgear equipment since 1952. He came to Allis-Chalmers in 1930 and has been with the switchgear department since 1936.

Albert H. Clarke, commercial vice-president of Crouse-Hinds Co., Syracuse, N. Y., has been named vice-president in charge of engineering, effective November 1, according to **John R. Tuttle**, company president. He succeeds **Carl H. Bissell**, retiring after 53 years of company service.

Both Mr. Clarke and Mr. Bissell have contributed importantly to the development and application of Crouse-Hinds products — Condulets, explosion-proof electrical equipment, traffic signals, floodlighting and aviation lighting.

Besides conceiving the first automatic traffic signal controller, Mr.

C. H. Bissell

Bissell, as chief engineer, pioneered the company's development of explosion-proof electrical equipment for hazardous areas. In 1928, Mr. Bissell helped draft the first National Electrical Code requirements for

A. H. Clarke

explosion-proof equipment in hazardous areas.

Mr. Clarke joined the company in 1925 and became commercial vice-president in 1952. While serving as illumination manager, he fostered sales engineering and promotion of Crouse-Hinds floodlights, searchlights, and airport lighting, working with government aviation and weather agencies on many airport lighting developments.

Jay R. Petree, assistant chief engineer, will now become chief engineer, and **John R. Haney** will succeed Mr. Clarke as manager of Crouse-Hinds Illumination Department.

Edward F. Greiwe has been appointed manager of product sales, electrical section, Allis-Chalmers Norwood Works, according to an announcement by G. A. Sarr, manager of the electrical section at Norwood Works.

In his new position, Mr. Greiwe will be in charge of all matters pertaining to the sales and service of Norwood electrical products.

Mr. Greiwe started with Allis-Chalmers in 1936. During World War II he served in the South Pacific, and returned to Norwood Works centrifugal pump section as an estimator. In 1949 he was named an application engineer in the Norwood electrical section. In 1955, he became assistant to the manager of the electrical section, the position held until his present promotion.

The appointment of **J. C. Hamilton** as manager of sales for the **Advance Transformer Co.**, Chicago, has been announced by **Max D. Orr**, vice-president and manager of marketing.

Mr. Hamilton, a graduate of Illinois Institute of Technology, has been actively engaged in the fluorescent lighting industry for the past seven years, and had formerly been associated with the company in the capacity of sales engineer.

Moloney Electric Co., transformer manufacturer located in St. Louis, Mo., announces that **C. M. Lovell**, formerly vice-president and chief engineer, will be vice-president in charge of engineering and research.

Mr. Lovell joined the Moloney organization in 1920 as an engineer. He was made chief engineer in 1928. In 1942, he was appointed vice-president and elected to the board of directors.

Mr. Lovell has been instrumental in the development of concentric-layer winding and its application to transformer manufacture at Moloney.

Another change in Moloney personnel which was recently announced is the appointment of **David F. Winter** as vice-president, chief engineer and director of research. Mr. Winter will continue in his recently-appointed post as director of the newly-formed Engineering Research

C. M. Lovell

and Development Laboratory. He received his B.S. in Electrical Engineering from Washington University of St. Louis in 1942 and after graduation served as a staff member at the Radiation Laboratory of the Massachusetts Institute of Technology where he worked on the early

D. F. Winter

development of Radar Pulser, high-speed oscillographic instruments, and high powered magnetron operation. He was engaged in various research and consulting engineering until he joined Moloney Electric in 1952 as a consultant. In 1954, Winter joined Moloney on a full time basis and established the Engineering Research and Development Laboratory.

A number of changes in executive personnel, made effective November 1, have been announced by **J. Robert Welsh**, president of **Southwestern Gas and Electric Co.**, Shreveport, La.

E. F. Graham, vice-president and East Texas division manager for the past eight years, is returning to the general office in Shreveport as vice-president in charge of all commercial activities, rates and supervision of division offices.

W. J. Sedberry, local manager at Henderson, Tex., since 1950, will succeed Mr. Graham as East Texas

division manager, with offices at Marshall. **Ed Strong,** office manager at Henderson succeeds Mr. Sedberry.

S. M. Sharp, vice-president, who has been on leave of absence for six months, returns to active duty with the company as vice-president in charge of engineering. **Jack Watts,** who was recently named treasurer of the company, also becomes secretary, succeeding **E. H. Wilson,** who retired October 31.

Forwood C. Wiser has been appointed vice-president of the **Pittsburgh Standard Conduit Co.,** it was announced by Robert G. McIlroy, president. Mr. Wiser will assume over-all responsibility for all sales and production activities at the company's new Morrisville Plant. He will concentrate on developing the Morrisville operation into an independent unit able to offer especially prompt and reliable service to both East and West Coast customers. Mr. Wiser came with Pittsburgh Standard in 1954 as assistant to the President.

Free bulletins

available to our readers

Wiremold's **Catalog and Wiring Guide** No. 20, containing complete descriptive and ordering information of the company's line of raceways, fittings and other wiring materials, has been recently released. Copies are available from **The Wiremold Co.,** Hartford 10, Conn.

Union Insulating Company's complete line of electrical products for wholesale distribution is fully described and illustrated in the **new catalog** which has been released by the company.

In addition to complete specifications and catalog listings, the new bulletin contains distributor and suggested trade discount sheets and illustrations of possible applications of Union Insulating products.

Copies may be obtained by addressing the company, P. O. Box 351, Parkersburg, W. Va.

Known as **Bulletin No. 51,** "Safe Electrification for Your Portable Tools on Production — Assembly Lines" details the advantages of the Feedrail System of enclosed trolley busway electrification. The bulletin tells "What It Is" and "What It Does," and pictures the application of the Feedrail Systems in production, assembly and test lines.

Copies may be secured from **Feedrail Corporation,** 125 Barclay St., New York 7, N. Y., without obligation.

Marking its 35th year as a leading producer of electrical wiring devices and specialties, **Eagle Electric Manufacturing Co.,** 23-10 Bridge Plaza, Long Island City 5, N. Y., has issued its **new enlarged 68 page catalog.**

Approximately 100 new items have been added this year. Included among these is a complete line of 125 and 250 volt grounding devices to meet new NEC and UL requirements. Other new items are flush range and dryer receptacles and wall plates, weatherproof switches and receptacles, heavy duty caps and connectors with cord clamps and four wire Eagalok locking devices. Illustrated in full color are new lamps such as: a bakelite pin-up lamp, a bakelite desk lamp and a hand applied decorated bed lamp.

How electrical system operating conditions can be improved through use of **Allis-Chalmers distribution transformers** is told in a new 16-page bulletin released by Allis-Chalmers Mfg. Co., 938 S. 70th St., Milwaukee 1, Wis.

The bulletin tells how Allis-Chalmers distribution transformers make use of "Curvacore" construction which utilizes the directional properties of preferred oriented cold-rolled core steel. It describes coil, tank and bushing design and construction.

Distribution transformers covered in the bulletin are rated 3 through

The hundreds of products made by **Hubbard and Co.,** are described and illustrated in a large **new catalog,** just published.

Standard pole line hardware and electrical specialties for communication line and power line construction are covered, and are carefully indexed. One section is devoted to aluminum street lighting standards and accessories, made by Hubbard Aluminum Products Co., a subsidiary.

Tables of weights, measures, and material properties are included in the catalog. Any other persons requiring copies in their work are invited to send their requests to the nearest distributor or to Hubbard and Co., 6301 Butler St., Pittsburgh 1, Pa.

design
by
mc Philben
A Vapor-Tight Wall Bracket
dynamically new . . . obsoletes all old wall brackets!
A modern building with yesterday's fixtures is like a lovely woman wearing last year's hat. McPhilben's new multi-use wall bracket the '43-40 series is beautifully honest in design . . . of rugged, no maintenance-needed, die cast aluminum vaportight, versatile and competitively priced.
APPLICATIONS: Stair landings, Corridors, Lavatories and Entrances, Schools, Hospitals, Office buildings and Housing.
SPECIFICATIONS: 43-40 VT, die cast aluminum, satin finish anodized, quickly mounts to 4" cast iron junction box . . . for indoor application suitable for standard outlet box.
WATTAGE: Maximum 100 watt — Globe: Threaded opal with gasket. Write for Data Sheet on complete VAPORTIGHT SERIES.
DIE CAST PROTECTIVE GUARD AVAILABLE (43-44VT) for locations where protection against theft and vandalism is essential. Also available as a ceiling fixture.
1349 Willoughby Ave., Brooklyn 37, N. Y.
CONSULT
mcPhilben Lighting
SPECIFY
Representatives in major cities
Stocked By Electrical Wholesalers

167 kva single-phase, 15 kv and below. Mechanical information concerning the units is included as well as recommended installation practice for the transformers.

A new Datalog of the **Holophane Co., Inc.,** 342 Madison Ave., New York 17, N. Y. is off the press. The new 64-page Datalog is more than a product catalog; it is a **reference guide to the fields of commercial, institutional, industrial and outdoor lighting.** The Datalog explains the fundamentals of light control, as well as giving recommended illumination levels and lighting design data.

The description of the Holophane units is supplemented with large photographs and clear cross-sectional drawings or exploded views. Distribution curves show the performance of each unit. Pertinent information on installation procedure, special applications, spacing, etc., is included.

A new 25-page 1956 catalog describes 52 **portable electric tools and kits** with over 400 accessories for builders, carpenters, plumbers and electricians. Industrial maintenance men, heating and air conditioning contractors, repair men and specialty trade workers will also find this a valuable guide to power tools. This free book includes 150 pictures of tools and their uses with complete specifications and prices for electric saws, sanders, drills, planes, routers, shapers, combination tools, and grinders. Write for catalog No. 102, **Porter-Cable Machine Co.,** 58 Exchange St., Syracuse 8, N. Y.

A new two-color illustrated four-page catalog (Bulletin No. 6414) describing the new Model G Ventura **fans for business and commercial exhaust applications** is now available from **American Blower Corp.,** Detroit 32, Mich.

The new catalog lists such performance data as cfm at various static pressures, fan rpm, motor hp, quietness rating and maximum net weight for each of the 25 different direct-drive units in the new Model G line. Recommended time for complete air changes for various establishments is given.

"Network Protectors for A-C Secondary Network Systems" is the title of a new bulletin just published by the **General Electric Co.,** Schenectady 5, N. Y. Designated GEA-2017E, the 28-page bulletin covers all phases of A-C secondary networks. Illustrations include numerous diagrams, charts, and photos of the units and their components, with detailed description of their operation. Also included are discussions of fuses and relays in network protectors. Complete specifications of all types are included.

A six-page descriptive folder on the new **"Smithcraft Overall Illumination" System** has been released by the **Smithcraft Lighting Division,** Chelsea, Mass. Included are detailed descriptions of the system's exclusive features, complete mounting and construction details, and simple procedure instructions for determining correct illumination intensity for users. Copies of the folder may be obtained by writing Smithcraft Lighting Division, Chelsea 50, Mass.

New coil-less type relays, designed to function like current transformers, are described in Publication No. 584, recently issued by the **Automatic Switch Co.,** 391 Lakeside Ave., Orange, N. J. A load cable running through the relay provides the magnetic field for relay operation.

A new eight-page publication describing the complete line of **G-E magnetic starters** for air conditioning and refrigeration equipment is available from the **General Electric Co.,** Schenectady 5, N. Y.

Designated GEA-6301, the illustrated bulletin describes features, ratings, and dimensions of the starters. It also contains wiring diagrams, catalog numbers, and installation requirements.

Steber Manufacturing Co., Broadview, Ill., has recently issued a catalog bulletin (Bulletin No. 1080) illustrating and describing its new line of **"Curvette" reflector lighting units.** Curvettes have 7½-inch long spun aluminum shields in streamlined or Swedish modern design. Either style can be furnished in bright anodized (Anodal) aluminum finish, or rich, jet black.

A new two-color, illustrated, four-page catalog (Bulletin No. 6514), describing the new **Model K Ventura Fans** for industrial heavy-duty exhaust applications, is now available from **American Blower Corp.,** Detroit 32, Mich.

A new bulletin covering **General Electric's new vertical Tri-Clad®** motor has been announced by the company's Medium Induction Motor Dept.

The multi-colored, 12-page publication, emphasizes reduced maintenance costs and simplified lubrication of the new motor which is of the shielded (dripproof), hollow-shaft, high-thrust type ranging from 7½ to 500 hp.

Designated GEA-6280, the new bulletin is available from the General Electric Co., Schenectady 5, N. Y.

A four-page descriptive folder on the new Smithcraft "Cleer" has been issued by **Smithcraft Lighting Division,** Chelsea 50, Mass. A number of photographs are included to illustrate the smart, shallow appearance of this **modern fluorescent fixture** with plastic sides and plastic louver.

A new approach to step regulator application as a possible solution to the load growth problem is contained in a leaflet (21R8317), entitled **"How to Increase Step Regulator Ratings,"** released by **Allis-Chalmers Manufacturing Co.,** 938 S. 70th St., Milwaukee 1, Wis.

Tomic Sales & Engineering Co., 20,000 Sherwood Ave., Detroit 34, Mich., has published **a new, complete catalog** on the entire Tomic line. Featured are Tap-On connectors and couplings, Romex connectors, service entrance and range connectors and Tomic's box or fixture hanger for concrete work.

The line of **fluorescent and incandescent lighting fixtures,** troffers, hangers, and troffer accessories manufactured by **Southern Lighting Mfg. Co.,** 501 Elwell St., Orlando, Fla., is completely discussed and illustrated in the catalog recently made available by the Florida firm. The fixtures are suitable for school, commercial, and industrial applications and are manufactured in a wide variety of types and sizes.

Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill., distributors of radio and electronic parts and equipment, announces the release of their **1956 general catalog.** Reflecting the continuing growth of the industry, Allied's new 324-page catalog (128 pages in rotogravure and four-color covers) lists over 26,000 items.

A new, two-color bulletin on **General Electric's** general-purpose, full-wave, Thy-mo-trol® **adjustable-speed drive** has been announced by the company's Specialty Control Dept., Schenectady 5, N. Y.

The eight-page publication, designated GEA-6234, cites in detail the drive's simplicity of operation and economy. Featuring several industrial applications, the bulletin emphasizes the unit's printed control circuits.

Technical Books

Practical Radio Servicing

By William Marcus and Alex Levy, McGraw-Hill Publishing Co., 327 W. 41st St., New York 36, N. Y., 559 pages, $8.50.

Assuming the reader has no previous knowledge of radio, this manual guides the beginner from a simple interest in radio servicing to the point where he can operate as a proficient repairman.

The book tells how to test, repair, and replace parts of a-c/d-c superheterodyne receivers, battery receivers, three-way portables, and small phonograph combinations. It describes the operation and use of test instruments for servicing work, and gives trouble-shooting shortcuts for identifying faults. It tells what tools are needed, and explains how to use them.

Practical job sheets are included for use with an actual receiver to give the reader real experience with servicing problems and procedures.

The reader should become equipped to handle any type receiver by being first introduced to the most common type circuit for each receiver. Having mastered the basic set, he is then shown the most important variations and their special requirements.

Service data charts are given throughout the book for on-the-job reference. These list trouble symptoms and tell what to look for when making tests.

William Marcus is assistant principal, Corona Junior High School, and Alex Levy is radio teacher, Chelsea Vocational High School.

NEMA Standards

Available from National Electrical Manufacturing Association, 155 E. 44th St., New York 17, N. Y.

The following NEMA Standards Publications have just been printed, and copies are available for immediate distribution:

Coupling Capacitors, Coupling Capacitor Potential Devices and Line Traps, Publication No. SG 11-1955. Rating, testing manufacturing and performance are covered in this publication. The terms used are defined. $2.50.

Large Air Circuit Breakers, designated as SG 3-1955. This revised publication covers a.c. breakers rated 600 volts and less and d.c. breakers rated 3,000 volts and less. Instructions are given for the installation, operation, and care of such breakers, and the terms used

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Outstanding Features of Model 610 Automatic Ceiling Shutter

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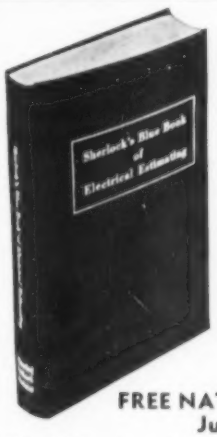

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This book is easy to use—it has no complicated mathematics or formulas to work over. You merely determine the nature of the wiring, check it in the BLUE BOOK OF ELECTRICAL ESTIMATING and there's your answer—it's the simplest estimating book ever written.

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This book was written by a successful electrical contractor and estimating engineer with over 20 years' experience. It has an entirely different method of determining estimates on wiring jobs. Electrical contractors, journeymen, architects, and engineers will find use for this book every day. Gives time required to do jobs along with complete labor charges in every state in the country. Order this book now at special introductory price of $7.75. As a special offer to Electrical South readers the publishers give a free copy of the latest National Electrical Code Book just for examining the 1956 Blue Book of Electrical Estimating.

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Send me the NEW BLUE BOOK OF ELECTRICAL ESTIMATING and the latest edition of the National Electrical Code Book for 5 days free trial. I understand I may return the book within 5 days and owe nothing. If I keep it I will pay $7.75 plus postage for shipping. I keep the Code Book FREE even if I return the Blue Book of Electrical Estimating.

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Dec., 1955

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Methods of Rating and Testing Home Freezers, publication FH 1-1955. ASRE, ASA, and NEMA have approved this standard which prescribes methods of testing and rating self-contained freezers used primarily for the freezing of, and storage of, frozen foods for farm and home use. 25 cents.

Polyphase Motor Starting Current Rules, publication No. 151-1955. This report was developed by the Joint Committee on Motor Starting Currents of the AEIC, EEI, and NEMA. It is intended to promote a better understanding of the effect of starting currents in the problems of motor applications. 25 cents.

Primary Unit Substations, publications 201-1955 to 207-1955. Standard equipments and additional and alternate standard equipments are given for the following: (1) Articulated primary unit substations — radial, primary-network, spot-network, low-voltage selective and duplex types; (2) Integral primary unit substations; and (3) Highway-type mobile primary unit substations. $3.00.

National Fire Codes

Six volumes, available from National Fire Protection Assn., 60 Batterymarch St., Boston 10, Mass., 4100 pages, $6.00 per volume.

Vol. I, Flammable Liquids and Gases.
Vol. II, Combustible Solids, Dusts, Chemicals and Explosives.
Vol. III, Building Construction and Equipment.
Vol. IV, Extinguishing Equipment.

Vol. V, Electrical, National Electrical Code with corrections, interpretations and interim amendments to date, plus six other NFPA electrical standards and a digest of the electrical provisions of 68 other NFPA standards.

Vol. VI, Transportation, 21 standards on air, marine, and highway transportation, plus a comprehensive review of applicable government regulations.

First issued in 1938, each volume of the National Fire Codes has been periodically revised and expanded. There are a total of 43 changes in the 1955 volumes incorporating all of the new and revised fire safety standards adopted at the 1955 NFPA annual meeting and all amendments approved up to July 30, 1955.

The Codes and the NFPA standards they contain are intended to provide guidance for achieving reasonable safety to life and property, yet avoid provisions involving inconvenience and expense not essential to the objective of practical fire safety.

Purely advisory as far as the National Fire Protection Association is concerned, the codes are widely used in the United States, in Canada, and abroad as a basis of sound practice by property owners, legal and insurance interests, and others responsible in the field of fire safety.

NFPA standards are prepared by 100 technical committees composed of experts representing the general public, government, industry and insurance.

Many of these same standards have subsequently been adopted and published as the official standards of the National Board of Fire Underwriters, the Dominion Board of Insurance Underwriters, and other organizations.

New products

Versatile school lite highlights Southern line

Designed for either surface or stem mounting of 20 and 24 gauge steel, and available in two-lite, 40-watt or two-lite, 75-watt sizes, regular, rapid start, or slimline, the 45 by 45 degree troffer fixture designed for use by schools, is a highlight of the line of fluorescent and incandescent fixtures manufactured by Southern Lighting Mfg. Co., 501 Elwell St., Orlando, Fla.

The louver assembly of the unit hinges from either side for easy servicing without the use of tools. It is equipped with bi-pin lamp holders for conventional lamps, and all slimline units have telescopic type sockets for single-pin lamps. The fixture is wired for 110-125 volt, 60 cycle a.c.

Unique design for new cable clamp

Anderson Brass Works, Inc., Birmingham, Ala., manufacturer of power connectors, clamps, fittings and accessories, announces a new "Snub Seat" Straight Dead End Strain Clamp. The unique snubbing design of the seat and keeper assembly, according to Anderson, gives this clamp high holding power.

Anderson has supplied the following pull test data, which designates holding strength in pounds on five popular cable sizes: 1/0 ACSR — 3850, 2/0 ACSR — 4150, 4/0 AL — 4050, 4/0 ACSR — 5975, and 336.4-18/1 ACSR — 8950.

The body and keeper of the new Anderson "Snub Seat" Clamp are high strength cast No. 356 aluminum alloy, heat treated. The U-bolts are peened to unit keeper to facilitate ease of hot-line work. Conductor can

be inserted through clamp without removal of U-bolt nuts. The one-piece assembly of U-bolts and keeper helps to distribute pressure over large area and prevents damage to cable. No liners are required. Ease of handling is further provided for in design of "come along" eye. A "lifting" eye . . . not shown in the photograph . . . is optional for use in hot-line work. Flared mouth protects cable from chafing and crystallization due to vibration. Adequate length allows conductor to clear insulator disc. Cables can be extended either above or below.

The slip-strength of the clamp is a minimum of 90 per cent of rated breaking-strength of all-aluminum cables within clamp range. Five sizes of the clamp are available for complete range.

Chromalox radiant panel features fast installation

An interesting new development in electric room heaters is a radiant wall panel that combines extreme mounting ease with an unbreakable, all-metal construction. The unique design of the heating element gives positive protection against electrical shocks and is completely guarded against moisture and rough usage, according to the manufacturer, Edwin L. Wiegand Co., 7500 Thomas Blvd., Pittsburgh 8, Pa.

The tubular metal element is similar to the rugged type heating units immersed in chemical solutions by industry or to electric hot water

Here's where you get the answers to conduit problems

● Look under "The Youngstown Sheet and Tube Company" in one of these alphabetical or classified phone books.

They represent the 28 conveniently located district sales offices Youngstown maintains across the country. Offices staffed by men who understand **your** problems and who are qualified to help you get the conduit you need.

If you aren't in touch now with a distributor of Youngstown Buckeye Conduit, just call the Youngstown district office nearest you and they will help you solve your conduit problems.

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THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

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heaters and electric range units in the home. The heart of the element consists of a nickel-chromium resistor wire packed in a high density insulating refractory and totally enclosed in seamless tubing for positive electrical insulation.

Completely factory assembled, the panel may be surface-mounted on open walls or under windows in a matter of a few minutes with the simplest of tools. Where minimum projection into the room is desired, it may be recessed against wall studs or to a total depth of 2¾ inches.

Murray offers 'pint-sized' 30 amp type 'G' switches

MURRAY MANUFACTURING CORP., 1250 Atlantic Ave., Brooklyn 16, N. Y., announces two new 30 Amp Type "G" Safety Switches— the 30 Amp "Small" Switch (5¼ inches x 2¾ inches x 6¾ inches) and the 30 Amp "Pony" Switch (3⅞ inches x 2⅝ inches x 6¼ inches).

Both switches are fusible, single throw, side operated and have visible knife blade construction for ease of inspection and maintenance.

The "Small" Switch has a helper spring for simulated quick-break action to minimize arcing and provide safer operation.

The "Pony" Switch, designed specifically for oil burner protection,

is a compact two-wire, one blade switch with plug fuse.

Both switches have rigid construction with covers deep-drawn from high quality steel mounted on sturdy boxes to insure non-binding operation. Numerous knock-outs are provided, concentrically and accurately stamped for clean, quick removal. Switches are sealable in both "Off" and "Closed" positions.

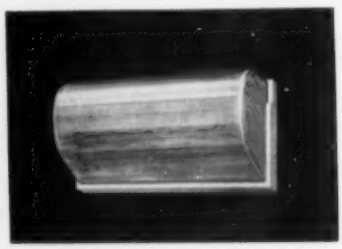
Switches have the same streamlined styling as the Murray regular Type "G" Line and are finished in durable Melamine - base, gray enamel.

The "Small" Switch is available in either plug or cartridge fuse, two or three wire.

Art Metal fixture ideal for bed light

A SPECIAL LENS lighting element has just been released by the Art Metal Co., 1814 E. 40th St., Cleveland 3, Ohio. Called the Wallens, it is designed for wall mounting in homes, hospitals and in commercial corridors.

The lens directs the light distribution to a three-way asymetric pat-



tern to provide direct and indirect illumination. Its applications include its use as a bed light, over bathroom mirrors, over kitchen work areas and sinks.

G-E Limitamp control saves on floor space

A NEW Limitamp® high-voltage motor control, saving more than 50 per cent in floor space over previous models, has been announced by the General Electric Company's Industry Control Dept., Schenectady 5, N. Y.

A high-voltage fused starter for co-ordinated control of motors up to 3000 horsepower on 2300- to 4800-volt systems, Limitamp control offers better protection against circuit faults up to 60,000 amperes. Designed to give maximum short-circuit protection, fuses of high interrupting capacity limit current flowing in a fault within one quarter of a cycle and interrupt within one-half cycle.

Two construction features make this floor space saving possible. The new Limitamp units are only 30 inches deep, exactly one-half the depth of previous standard enclosures. Being all front connected, the new enclosures can be mounted back-to-back or back-to-wall, and no rack aisle is required.

Anaconda bulletin shows Powerduct cables

A NEW four-page folder describing their line of Powerduct cables for flexible bus-drop power distribution has been released by Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y.

The folder gives complete information and tabular data on the company's Duracord and Densheath type cables, as well as directions for normal installation with overhead bus-duct.

As used with bus-duct, the Powerduct cables permit fast, economical installation and relocation of machines. Extensive rewiring is unnecessary. Distribution of power is completely flexible.

Both of the Anaconda cables are rated at 600 volts and have three conductors with ground wire. The Duracord cable uses rubber insulation and a tough jacket made of heavy, long-fiber cotton woven like a fire hose. In the Densheath cable, conductors are insulated with PVC and the jacket is of the same material.

Day-Brite Rangers have spring-loaded sockets

DAY-BRITE Lighting, Inc., 5411 Bulwer Ave., St. Louis, Mo., announces its new open-type Ranger Series. Rangers are available in four and eight-foot lengths for two or four lamps. A special feature of this new series is push-type, spring-loaded sockets which are metal clad to insure positive lamp alignment, secure lamp support and protect lamps against breakage. The trim, tapered design of these sockets minimizes shadow between lamps when Rangers are mounted in fixture runs. Four-foot units are furnished with Rapid-Start ballasts. Eight-foot units can be supplied with either Slimline or High-Output Rapid-Start ballasts.

These entirely new open-type fixtures will find many applications

in drug stores, super markets, variety and hardware stores where brightness is so desirable for attracting customers and lending a bright, clean atmosphere to the store interior.

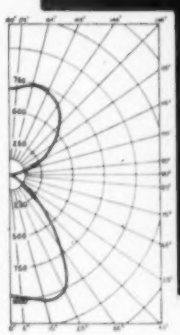
CERTIFIED 45° x 45° SHIELDING FOR SCHOOL LIGHTING

HIGH IN EFFICIENCY 80.5%

HIGHER IN REFLECTANCE 0.93%

HIGHEST IN QUALITY

Fluorescent by Southern



Here is a fixture not only pleasing to the eye with a 45° x 45° shielding angle, but it has all the qualities of SOUTHERN'S best in design and construction. Can be wired with regular, rapid start, and slimline ballasts. These 2 lite, 4 and 8 foot fixtures are constructed of heavy guage cold rolled steel, designed for either surface (ceiling) or suspension (stem) mounting. The modern designed louvers are securely attached to the "V" type reflector forming one unit, and may be lowered from either side without the use of tools. This SCHOOLITE fixture may be joined in continuous rows without additional parts.

Remember, specify and satisfy with SOUTHERN fluorescent fixtures.

SOUTHERN LIGHTING MFG. CO.
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NEO-RAY **ROTO-STRIP**
C.S.A. APPROVED Pat. Pend.

Convention booths come to life with Roto-Strip. Here's the ideal way to highlight displays, products, and the booth itself. Roto-Strip costs so little . . . requires no installation . . . easy to carry . . . easy to ship.

This complete shallow unit (available in several types) has built-in recessed roto sockets that swing 90° in all directions through a complete 360° circle . . . and stay put at any angle. Available in stock sizes of 2' —3' —5' and 8' lengths.

Surely Roto-Strip has a place in your plans.

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DROP LIGHT REELS

Reg. U.S. Pat. Off.

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A rugged and dependable piece of equipment that gives you light where you want it . . . when you want it.

- ★ Crack-proof phenolic pistol-grip handle includes the time proven LEVOLIER toggle-action switch and socket.
- ★ New type heavy duty, all steel, all chrome reflector with swing-open guard.
- ★ Heavy gauge steel casing . . . smartly styled with a strikingly new textured finish . . . grease and oil resistant and set off by gleaming chrome trim.
- ★ Underwriters' approved SJ Neoprene cord features a kink proof, moulded-into-cord jacket construction . . . oil and water resistant.
- ★ Tool-proof gravity action locking mechanism has nothing to break or jam.
- ★ The UNDERWRITERS' LABORATORIES INC. sealon CORDOMATIC DROP LIGHT REELS is your assurance of safety and dependability.

Cordomatic ★ DIVISION OF THE VACUUM CLEANER CORP. OF AMERICA

1724 INDIANA AVE., PHILA. 32, PENNA.

Electric clock outlet has deep recessed back

A NEW OUTLET specially designed for use with electric clocks not only provides electrical connection for the clock but supports it as well, according to the manufacturer, John I. Paulding, Inc., New Bedford, Mass. A deep, rectangular recessed back provides extra room for nesting the clock cord. In use, the outlet holds the clock on a cadmium plated steel hanger, and is completely concealed from view.

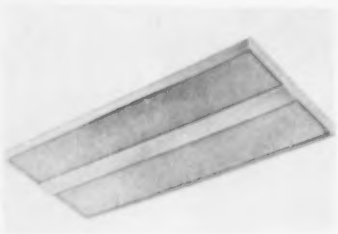
The new No. 1480 clock hanger outlet is of one piece molded Bakelite construction and has spring bronze double-wiping contacts. The unit is available in brown or ivory, and is listed by Underwriters' Laboratories. Rating is 15A-125V, 10A-250V.

New LPI 'Thin-Lite' has low brightness lens

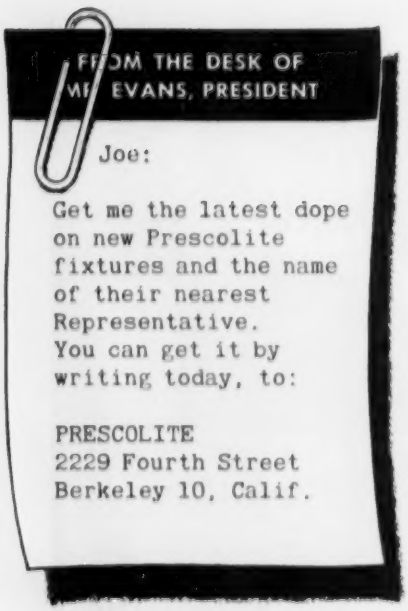
LIGHTING PRODUCTS, INC., Highland Park, Ill., announces that their new "Thin-Lite" series of fluorescent luminaires is now available with Corning No. 70 low brightness lens.

This lens is lightweight, efficient, and has a very low surface brightness. It is designed to deliver maximum illumination in useful directions with brightness reduced by prismatic action in the glare zone.

The blending of this lens with "Thin-Lite" results in a luminaire



that is unsurpassed for beauty and quality illumination. Designed for installation where surface mounting with a bare minimum of depth is desired, "Thin-Lite" creates a semi-recessed effect. Its depth below ceiling is essentially the same as that of troffers equipped with dished plastic or glass shields. Perfectly flat sides allow the architect to build up any pattern which he may choose.


FROM THE DESK OF
MR. EVANS, PRESIDENT
Joe:
Get me the latest dope on new Prescolite fixtures and the name of their nearest Representative.
You can get it by writing today, to:
PRESCOLITE
2229 Fourth Street
Berkeley 10, Calif.

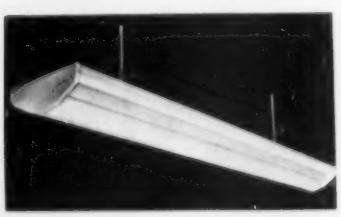
Progress offers five brass design fixtures

FIVE NEW ceiling fixtures in smart contemporary and early American brass designs have been introduced by Progress Manufacturing Co., Inc., Philadelphia 34, Pa., manufacturer of residential lighting fixtures.

All five are moderate priced pendant - style units of polished brass, equipped with metal reflectors with a white interior. Two of the new fixtures come with a frosted glass chimney and three in white opal glass. Distinctive shade colors include red and polished copper.

Leadlighter fixture increases light output

ALL THE ADVANTAGES of luminous indirect illumination are now combined with an increase of light output in the Leadlighter, a patented



unit manufactured by Leadlight Fixture Co., 800-100th Ave., Oakland, Calif.

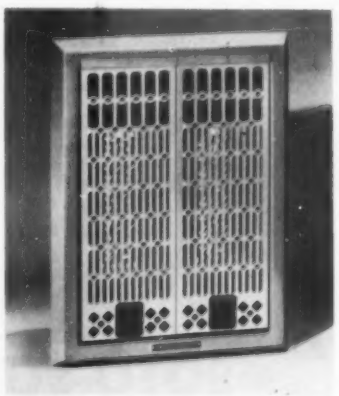
The use of 800MA lamps and ballasts contributes an increase in output without proportionate increase in cost, resulting in very high levels. The fixture maintains highly desirable low-brightness within the tenets of good lighting practice. Distribution is exceptionally wide above the 90 degree zone, yielding uniformly illuminated ceilings and much more light per unit in and below the 90 degree zone.

A noteworthy feature of this fixture is the method in which shielding is achieved. Parallel metal slats are so contrived that shielding is complete, yet light is directed and reflected to emerge and surround the unit with an ideal downward luminous component.

No materials are used which may warp, distort, discolor, crack, break or acquire electrostatic accumulations. The steel slat design also promotes cooling air currents which prevent the settling of dust and debris.

Westinghouse offers wall-mounted heaters

A SCIENTIFICALLY-DESIGNED line of wall-mounted home heating units, available in nine wattages from one to six kilowatts, is available from Westinghouse Electric Corp., Emeryville, Calif. The units come in four widths and operate on standard 230/240 volts a-c. Installation is similar



to that of a convenience outlet. The ruggedly-constructed box recesses into the wall and the frame mounts flush against the finished surface. There are no moving parts to wear out, cause noise, or require lubrication.

The scientific design provides heating by radiation of infrared rays as well as by continuous circulation of heated air. Heating elements, made of high-grade nickel chromium, are supported throughout their entire length by ceramic columns. Large plated-steel terminals prevent burn-off.

Each heating element is mounted in a separate aluminum deflector, providing more room for air circulation and more surface in contact

with the air. The grille will not discolor, and is easy to remove for cleaning. The welded-steel frame is finished with neutral-gray baked enamel.

The desired temperature in any room is maintained automatically by the built-in thermostat with "Adjust-o-matic" control. Only the current actually required is used. The three-position (low-off-high) switch is similar to that used on electric ranges. All units are UL approved.

Kelek entrance switch has cam-lock action

STAINLESS STEEL CAMS compress switch blades against the surfaces of rectangular copper tubing in a new service entrance switch designed by Kelek Co., Norwood, Mass. Positive locking prevents switch from accidentally opening under short circuit stresses, yet operation is so smooth that a child can operate the switch even after it has been closed for years. Great mechanical strength to resist the tremendous magnetic forces of short circuits is provided by heavy rectangular copper tube construction of jaws, hinge posts, fuse holders and terminals. Straight-line contact through blades substantially reduces these magnetic forces.

The new switch will accommodate several types of high interrupting capacity circuit protective devices, such as the Amp-Trap, the Hi-Cap or the Type X fuse, without the special adaptors required by conventional flat buss switches. Other design features include silver-plated contact surfaces and heavy-duty Kelek solderless connectors. These are built into the tubular switch parts and compress the cables directly against the walls of the switch.

All-welded aluminum cabinets prevent magnetic hysteresis currents being set up in frame or cabinet, thereby providing cooler operation. Reduction of enclosure weight to about one-third that of conventional type switches assures a savings in transportation and labor.

Rated capacities of the Kelek Cam-Lock Switch are 250 and 480 volts maximum, 1200 to 6000 amperes.

Trumbull circuit breaker available in six ratings

A NEW TWO-POLE common trip circuit breaker, for use in panelboards and load centers, has been announced by Trumbull Components Dept., General Electric Co., Plainville, Conn.

Designated Type TQL, the new two-inch breaker consists of two pole units with an interlocking trip mechanism assembled as a single unit. It will fit load centers or panelboards designed to take one-inch Type R or Type TQL circuit breakers.

The new two-pole Type TQL is available in six ratings from 10 to 50 amperes for 120/240-volt a-c operation. It has an interrupting rating of 5000 amperes a-c. All ratings are UL listed.

Excessive current in either pole of the new Type TQL breaker trips both poles simultaneously; this greatly reduces the risk of accidental shock.

Wakefield fluorescents give lighting flexibility

THE WAKEFIELD CO., Vermilion, Ohio, has introduced a new concept of schoolroom fluorescent lighting and space flexibility known as Photo-Metrics.

Photo-Metrics include a "package" of electrical channeling for nine standard classrooms 22 x 30 to

30 x 32 feet. From this channel hangs an extruded aluminum grid into which a copolymer vinyl diffuser is inserted. For economy the diffuser does not touch the side wall, but is close enough to prevent direct viewing of lamps.

For flexibility of space in new construction, the grid rails mesh into movable partitions. In rehabilitation Photo-Metrics can improve classroom proportions, lower apparent ceiling heights, cover unsightly ceilings and conform to or surpass accepted educational lighting recommendations. Cost installed is less than the cost of a lowered ceiling and the usual three rows of fluorescent fixtures, the company states.

Increased capacities added by Electromode

ELECTROMODE electric baseboard heaters are now available in 900 watt and 1200 watt capacities in addition to the 600 watt models, according to announcement made by Electromode Corp., Rochester 3, N. Y. Each capacity is made in models to operate on either 120, 240, or 208 volts. All basic units are 8½ inches high and three inches wide. The 600 watt models are 32 inches long, the 900 watt are 48 inches long.

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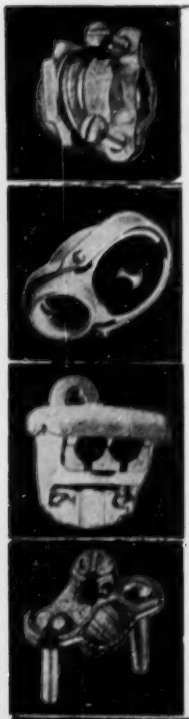

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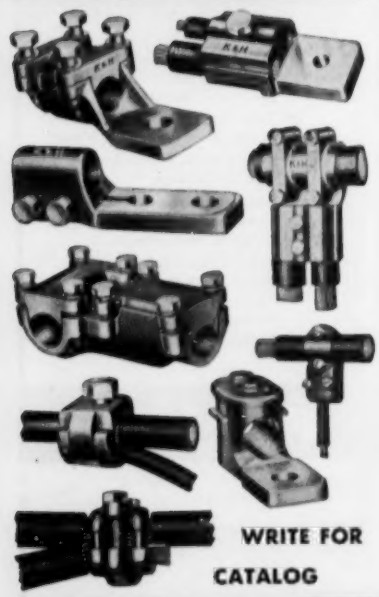

WRITE FOR CATALOG

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and the 1200 watt are 64 inches long.

Also an outside corner piece is now available, in addition to the inside corner piece, both designed with smooth rounded corners. These, together with the blank sections for extension, and right and left-hand end caps, all matching the basic units, make it possible to install a completely harmonious, unbroken baseboard effect which conforms to the design and dimensions of any size room. The silver grey hammertone finish is pleasing just as it is, or if desired may be painted to blend with room decor.

New chalkboard fixture announced by Sylvania

A NEW lighting fixture designed especially to illuminate chalkboards

has been announced by Sylvania Electric Products, Inc., Wheeling, W. Va.

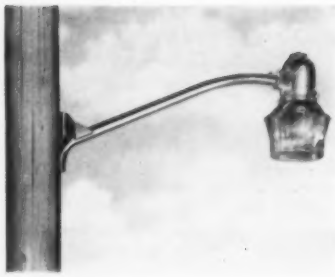
The new chalkboard fixture provides abundant light over the entire writing surface. Normal room lighting is often not sufficient to illuminate the writing surface without causing shadows and glare. The new fixtures provide this needed extra illumination and are useful wherever vertical surfaces require supplementary light.

The chalkboard fixture line is available in four, eight and 16 foot lengths in rapid and instant start. Knockout plugs provide for continuous row mounting. All painted parts are zinc-phosphate Bonderite treated after fabrication to prevent deterioration.

L-M announces open refractor luminaire

A NEW open refractor luminaire, designed primarily for either the 100-watt or 175-watt mercury vapor lamps, has been announced by Line Material Co., Milwaukee 1, Wis. Incandescent lamps through 6000 lumens can be readily accommodated also.

The new luminaire is used, but not exclusively, for application in residential areas. Refractors, for the new luminaire, provide either IES Type I, II, III, or type II four-way

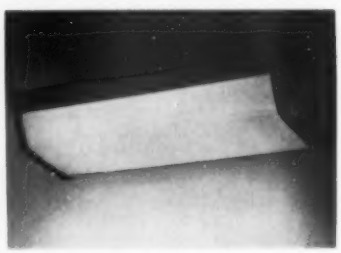


offset light distribution patterns.

Inherent features of the new luminaire are rapid and easy relamping, and excellent cooling ability. An alzak aluminum reflector, having a diffusing surface, is used for mounting the open refractor to L-M's standard NEMA large head. Pressure latches insure positive attachment of the reflector to the head. For added convenience, a V-band clamp is used that simplifies replacement of the glassware.

Wall fixture features quick, easy installation

EASY INSTALLATION and low upkeep cost are two outstanding features of "Wallite," a new line of fixtures for localized lighting by Gotham Lighting Corp., Long Island City 1, N. Y. Designed to provide plentiful, diffused illumination wherever localized lighting is required, the new products are offered in two



sizes. The larger size includes fluorescent as well as incandescent models.

Fixtures are completely wired and engineered for easy mounting over any type of flush outlet box. Lamps to 100 watts may be used in the smaller size fixture (No. 224), and two 75-watt sizes are suggested as maximum in the larger model (No. 211). In the fluorescent type (No. 2211), two T-8 fifteen-watt fluorescent lamps are used. All fixtures come complete with pull-chain switches.

Steber 'T' lights are all aluminum

ALL ALUMINUM horizontal fluorescent "T" lighting fixtures of ex-

ceptional beauty and durability have been announced by Steber Manufacturing Co., Broadview, Ill. Called "Skyliners," these new fixtures are available in four and eight foot lengths. These may be used individually or joined end to end to provide continuous strips of any length in multiples of four.

One feature is a center section comprised of heat treated interlocking aluminum extrusions forming a box girder for utmost strength and rigidity. Wrap-around doors of ribbed Tenite have a light emitting area more than 60 per cent greater than heretofore available in this type of equipment. Tenite panels in extruded aluminum frames eliminate breakage during shipment, installation or relamping. A vise-action pole fitter permits secure attachment at any point along the fixture channel.

These Steber "Skyliner" fixtures are completetly wired, ready for service connections and slimline lamps are mounted in position when shipped from the factory.

Pull-down fixture hides reel in canopy

A PULL-DOWN lighting fixture with its reel in a canopy has been developed by the John C. Virden Co., 6103 Longfellow Ave., Cleveland, Ohio.

The fashionably styled new fixture pulls down 53 inches from the ceiling, reels up 33 inches to serve as a ceiling light. Its 18-inch hood, finished in either brass, copper, pink, white or black, is decorated with

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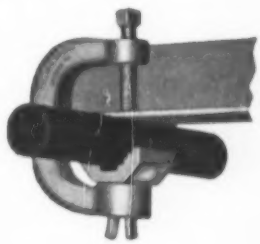

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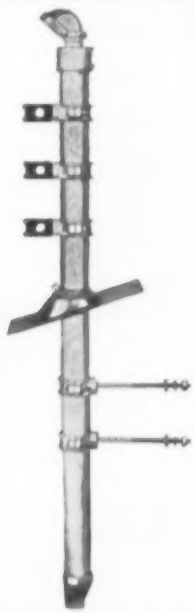

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tiny, symmetrically arranged perforations which also dissipate heat. Soft, adequate illumination is provided by three 60-watt lamps shielded by a frosted glass diffuser.

The new fixture's reel is concealed in a canopy instead of in a globe midway on the cord. Its thin, strong cable is obscured by the coiled black cord incorporated in the overall design. This new pull-down design is also used on three other new Virden lighting units.

Substation practices

(*Continued from page* 64)

tion of filtering blocks to reduce oil acidity, and the addition of inhibitor to add a longer life to the oil can be undertaken.

Emergency equipment

Since preventive maintenance and emergency maintenance necessitate stocking spare equipment and parts, the Duke system has a centrally located warehouse and storage yard wherein the majority of the replacement items for power and transmission stations are kept. These replacement items include bushings, steel, bus and bus components, oil circuit breakers and parts, transformers and parts, fence, control cable, disconnecting switches, air break switches, and, in fact, practically every item that is used in the field. The Duke system by the way, is now in the process of constructing a new $750,000 centrally located warehouse and storage yard wherein items used by both Distribution and Power Transmission Departments will be stocked.

At any given time, we are able to replace defective equipment over the system ranging from a closing coil on an oil circuit breaker to a complete transformer or transformer bank for the average size stations.

All defective bushings removed from field apparatus are brought to Charlotte where they are examined and it is decided whether to repair or to junk them. If they are to be repaired the Armature Winding Company in Charlotte makes the repairs under our supervision whereby we furnish or purchase repair material and they provide the labor and facilities. This arrangement has proven very economical and also provides a faster replacement of stock bushings than would be possible by purchasing new bushings.

At strategic locations over the system we have portable emergency three - phase transformers with multi-tap primary and secondary voltages which can be placed in service within a few hours should a failure occur. At the majority of stations delivering wye voltages there is a spare transformer which is placed in service if one of the transformers in service fails. We also have several portable spare single-phase transformers used for the same purpose.

One 500 KW portable generator, driven by an aircraft engine, is available for use at small stations where service cannot be interrupted for any appreciable length of time. This generator is used primarily during line work where there is no other available source of power for a portable transformer.

Economic comment

(*Continued from page* 14)

very easily be continued price expansion to a limited degree.

The flurry of stock splits has done much to bolster prices recently and to push them up to higher levels. Although these maneuvers actually promote no greater value to the shareholder, they do indicate the confidence of management in the continued progress of the company. Thus, coming at this time, they aided the strengthening of a market that appeared to be faltering slightly. One can anticipate that this evidence of strength will carry over nicely into next year.

NECA Convention

(*Continued from page* 34)

sparked the business development and national advertising programs of the electrical contracting industry.

The five vice-presidential posts — including vice-president-line construction — also were filled without a contest.

Charles W. Moseley, R. H. Bouligny, Inc., of Charlotte, N. C., was elected Vice-President-Line Construction succeeding Robert C. Hughes, of Portland, Ore. Carl L. Teal, Knight Electric Co., of Birmingham, Ala., was elected District Three Vice-President to fill post left vacant by Mr. Moseley.

Re-elected to office were District

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One Vice-President Alfred V. Bartlett, Sr., Rust Electrical Co., Inc., of Providence, R. I.; District Five Vice-President Harold J. Hill, Hill Electric Co., Inc., of Wichita, Kansas, and District Seven Vice-President F. E. Keith, Keith Electric Construction Co., of Des Moines, Ia.

Records system

(*Continued from page* 37)

too much labor on a job.

On contract jobs we place cost of materials on the time sheet. On cost plus jobs we list retail price of materials on the time sheet, and can arrive at how much the job is running the customer by a glance at the record.

Service schedule

We have derived a schedule of service rates on trouble calls from our job recording procedures. Within the city limits we have a minimum charge of $3 from 7:30 to 4 p. m., a charge of $4 after 4 p. m., a minimum charge of $4 on Saturday, a minimum charge of $5 on Sundays and holidays, and a $5 minimum on any day after 8 p. m. Charges on service calls outside the city limits depend on mileage. These rates are standard, even where a job takes only five minutes.

We have tried a number of different time sheets and find our present form quite satisfactory for our needs. We plan a few minor changes like having only one date space instead of a series. We shall retain the "Extra" and "Regular" box designations to indicate by a check when additional charges outside the initial estimated contract are to be made.

Records are dollars in your pocket. The story each job record tells is your chief index as to whether you are staying out of the red, and what you can do about changing the situation.

Maintenance contracts

(*Continued from page* 21)

this case, there has been no breakdown of operation in the three years that the contract has been in effect.

In a hotel service account, maintenance covers checkup of lighting, elevator service and air conditioning equipment.

At a shirt factory where rewiring had been done to increase capacity, a service account was obtained to keep in good repair 500 individual motors and connecting wires to the machines. Inspections here take place twice monthly in addition to the yearly overhauling of motors.

"After an installation or remodeling job has been carried out, we recommend and talk up the worthwhileness of service contracts," continued Mr. Ward. "When we see buildings going up, or obtain reports of anticipated construction, we see the building contractor about wiring arrangements. On the larger jobs we engage in competitive bidding, for if we get these jobs, there will be an opportunity to talk up a service contract."

Mr. Ward regards educating for preventive maintenance a hard uphill climb that is a challenge to the persistence and resourcefulness of the electrical contractor. But the satisfying rewards to both plant and contractor are the stimulus to taking on the challenge.

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Surge protection

(*Continued from page 42*)

appears to be somewhat controversial and beyond the scope of this discussion:

The grounding of devices or enclosures intended to play a part in overvoltage protection is important. It is recommended that grounds, conduits, pipes, machine frames, the ground terminals of arresters and capacitors all be tied together metallically. Joints in conduits for example, should be in good electrical contact and it is suggested that long conduit be connected to the general ground system at intervals. This is not only good from the standpoint of protection of insulation, but it is a good safety measure. If a section of conduit is not well grounded, and if there is a fault in it to a phase wire, the section of conduit may be hot and this may go undiscovered for a long time.

If all metal conductors in a structure are connected together, the structure is made into an equipotential volume as nearly as is feasible. Even if the resistance to true earth of this ground system is appreciable, and the structure is raised above true earth by a heavy current dischrage, the risk of high potential differences within the structure is reduced as much as possible.

In this connection it should be remembered that plastic pipe is not a conductor.

In conclusion, it seems to us that a review of the service experience on the 550 volts circuits in textile mills would be extremely helpful. What proportion of the insulation failures and faults on mill circuits is actually attributable to overvoltage? Is there experience that can be compared between unprotected and protected circuits? How much more trouble is encountered in mills that have a high lightning exposure than in those that have little? We do not say that overvoltage protection on the circuits is superfluous, although in many cases it may be; — it is quite possible, however, that troubles that are not the result of overvoltages may be attributed to overvoltage. For these, protection will not help and efforts put on searching out causes may be more rewarding.

Blast effects

(*Continued from page 48*)

(4) Radioactive fallout at both locations was low enough to permit repair work to start within a short time after the blast and to continue for an indefinite period. Probable reason: Bulk of fallout is limited to specific areas. Most of it follows the winds and does not spread radially from the blast site. The test installations were located outside the heavy fallout zone.

The report, however, notes some limitations to what might be drawn from these observations. First, quoting the AEC, it says that "test conditions (size of atomic device, and the intensity and area of its blast) may differ markedly from those which might be expected if nuclear weapons were used against our population in wartime." Second, it points out that "shielding" by trees, terrain and man-made structures, notably absent at the Nevada desert test site, might subject electrical equipment in an inhabited area to more extensive damage from flying debris and blast phenomena.

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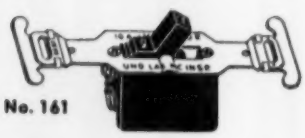

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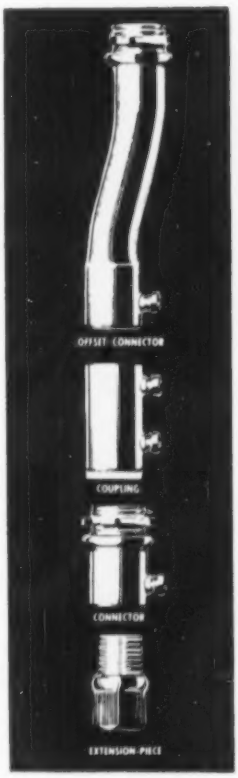

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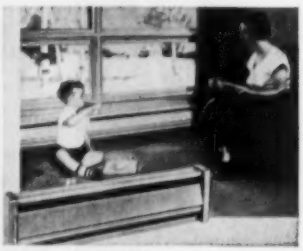

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- Fan-Circulated Heat
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For BIG Rooms
MODEL WA
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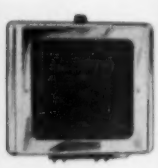

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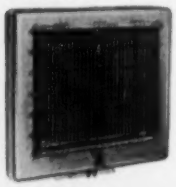

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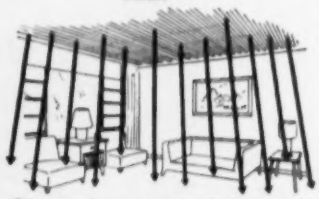

Diagram showing sectional view of cable before plastering illustrates how Electromode Ceiling Radiant Heat warms floors and everything in room.

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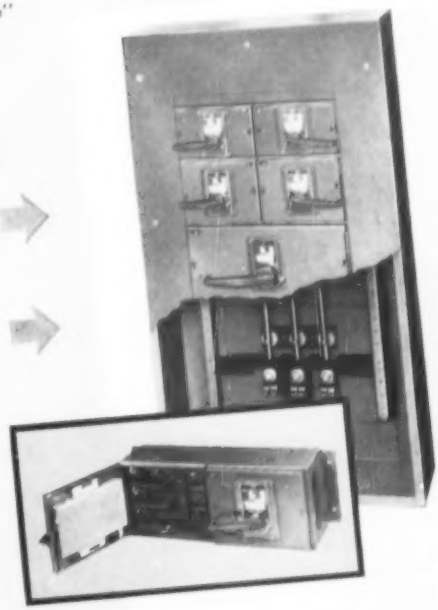

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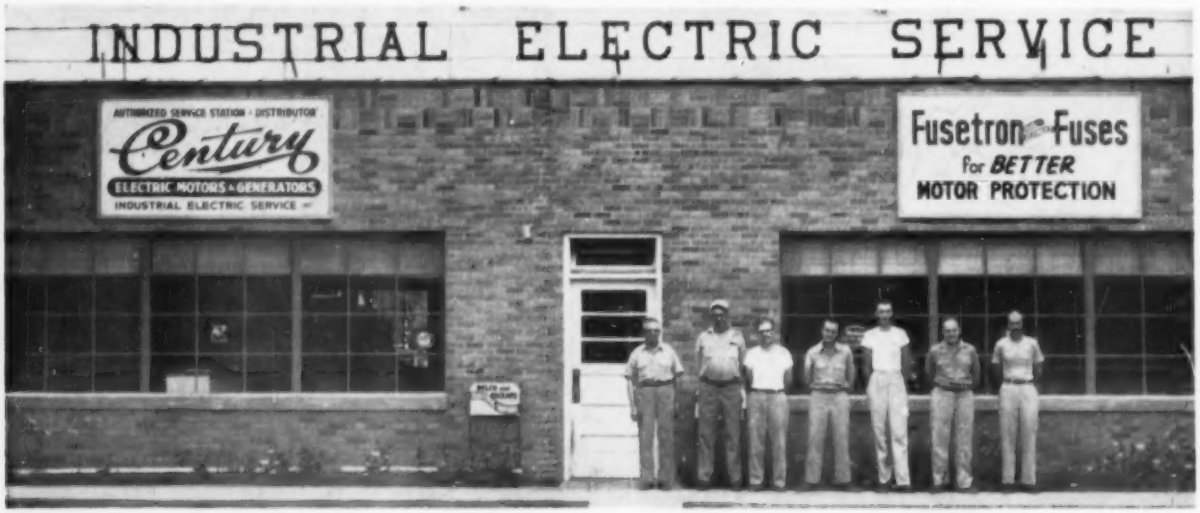

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